SURGERY OF HEAD AND NECK TUMORS

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A HOEBER-HARPER BOOK

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PART 2—ATLAS OF OPERATIVE PROCEDURES

Preface

The number of surgical procedures applicable to the head and neck is probably greater than those used in any body area of comparative size Aside from traumatic injuries (mainly war wounds) operations of radical extent in the head and neck are seldom indicated except for neoplasms chiefly cancer In this volume I have attempted to include a comprehensive description of operations for all anatomic varieties of tumors of the head and neck with the exception of brain tumors To the best of my knowledge, such wide coverage has not been attempted previously

Starting in Part 1 with a discussion of Basic Principles of head and neck surgery including aftercare and the management of complications the book continues in Part 2 as an Atlas of Operative Procedures grouped according to their anatomical site The Appendix includes an instrument list intended to be of assistance to the nurse in the operating room instructions for camera studies during operations and a sample of the Resident s Operative Report used by the Head and Neck Service of Memorial Hospital

The book is addressed primarily to the general surgeon I am convinced that the wide range of head and neck surgery can be performed successfully only by those who have a broad basic training in general surgery Head and neck surgery as a subspecialty of general surgery is a rather recent concept that is, the skills in this broad field have tended to be divided and isolated within separate and relatively narrow specialties For example surgery of skin cancer has been variously assigned to the plastic surgeon or to the dermatologist cancer of the larynx and of the paranasal sinuses to the otorhinolaryngologist cancer of the oral cavity and of the thyroid to the general surgeon The material in this book will be useful to all those who include head and neck surgery in their practice

The operations described here have been used repeatedly Where employed more than five years ago all have succeeded in producing permanent cures of cancer To attempt to include all possible variations of technics would be neither practicable nor useful In the present volume, the purpose has been to present at least one basic technic and a limited number of variations thereof for each surgical problem Oftentimes a particular technic has been chosen as the best of several which have been used successfully in the Head and Neck Service at Memorial Hospital. Technics that have been tried and found inadequate have not been included, but have been replaced by more successful procedures In a few cases a technic of limited usefulness has been included as a matter of record Despite careful selection of procedures to be included in this book new operative technics have been devised so steadily in the Head and Neck Clinic at Memorial Hospital that the size of this volume far exceeds the original plan

The author gratefully acknowledges his indebtedness to his associates in the Head and Neck Clinic at Memorial Hospital Many of the operative technics published here are evolutionary in character Some are original, yet the result of many years of the cumulative experience of the staff Certain details have been heatedly discussed at times in our weekly surgical conferences. As with most surgical operations, the original concepts of some technics included here may go back fifty or a hundred years.

Acknowledgment is also due my old friend Mr Alfred Feinberg, the surgical artist, whose unfailing patience, understanding, and tolerance with the temperament of a busy surgeon has made possible a successful and pleasant collaboration for over thirty years

It is obviously not possible that a surgical text can be either complete or permanently up-to-date any more than can a dictionary New words are being coined while new meanings are assigned to old words and new operative procedures are being devised while these books are in press. The present volume is actually an epitome of the greater portion of my surgical experience during the past thirty five years, and for practical purposes it is the best effort of which I am capable at this time

HAYES MARTIN

New York

SURGERY OF HEAD AND NECK TUMORS

DEDICATED TO THE MEMORY OF
JULES C ABELS
THE BEST DOCTOR
AND
JOSEPH J LERNER
THE MOST COURAGEOUS PATIENT
I HAVE EVER KNOWN

Part 1

BASIC PRINCIPLES

Chapter 1

HISTORICAL NOTES

A search of the literature prior to the eighteenth century for the beginnings of surgery of mouth cancer is not very fruitful. The few scattered allusions to operations for growths of the tongue and lip are invariably short, and in most instances the surgeon appears to be uncertain of the diagnosis It is understandable that the surgeon might be reluctant to propose a mutilating operation in the early stages of an ulcer of uncertain character of the tongue or lip and when it had advanced to a stage where the nature of the disease was unmistakable the growth would tend to be so advanced as to render surgery a formidable undertaking

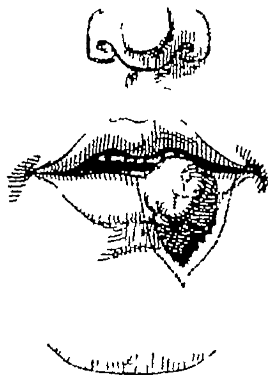
Although the microscope had been used for the study of cancer as early as the 1820's and 1830's, this method of diagnosis was still not widely accepted even as late as 1885 when Dr George R. Elliott promoted both lay and professional interest in histopathology by publishing a description of ex President Grant's cancer of the tongue.

Celsus (fl. 178 A D) is often credited in present-day medical writings as having described an operation for cancer of the lower lip and some have stated that this procedure was the classical V-excision. A perusal of translations or the original Latin text will reveal, however that although Celsus used the terms "carcinoma" and carcinode," and mentioned cases of the disease occurring in the skin of the face, breast, and in the region of the umbilicus he categorically advised against surgery in the treatment of cancer His mention of an operation on the lower lip was for the repair of a 'mutilation" (probably a war wound) and consisted of bilateral sliding flaps

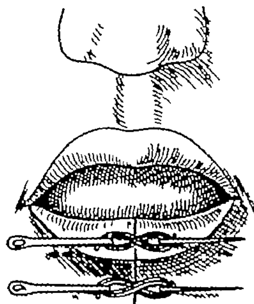
Abulcasis (1013–1107) and Avicenna (980–1036) both described the excision of tumors of the lip the wound to be left open, however, to heal by secondary intention. Ambroise Paré (1517–1590) Jean Vigier (fl. 1650) and Guy de Chauliac (fl 1368) make no mention of the V-excision The first V-excision (and, therefore probably the first operation for *early* lip cancer) is not described before the first half of the nineteenth century (Liston 1837, Begia 1839) (Fig. 1) These authors used pins and twisted cords for closure of the incision (Fig. 2) *

Although operations for early cancer of the lip were slow to come into common use until the nineteenth century more elaborate procedures had been devised much earlier such as that of Tagliacozzi (1545–1599) who described the repair of large surgical defects in various areas of the face, including the lip by a pedicle flap from the upper arm—an operation which still bears his name By 1859 von Bruns had

* The author once heard the late Dr Thomas Darlington (1858–1945) a practitioner for many years in New York City relate that one day when he was 8 or 10 years old, he was driving by horse and buggy along a country road with his father a general practitioner in the neighborhood of Yonkers. A farmer ploughing in an adjacent field stopped the doctor and asked advice about a sore on his lower lip Dr Darlington's father told the man the ulcer was cancer and that it should be cut out. The farmer agreed and proposed that it be done immediately The doctor using a knife from his pocket set and without anesthesia, excised the growth through a V-shaped incision, putting two common pins through the edges of the wound and wrapping a figure-of-eight of cotton thread about the pins. Then they drove on, while the farmer went back to the field *to unhitch his team and go home.*



1 V incision for cancer of the lip (From Liston s *Practical Surgery* London J Churchill Company 1837) As judged by present-day standards, the free margin of the excision as indicated by the dotted line would appear to be rather narrow



2 Closure of the wound of a V-excision of the lower lip by "pins and twisted sutures." A hundred years ago this maneuver was commonly used for the closure of incised or lacerated wounds anywhere about the body In old surgical texts this method was commonly illustrated for repair of harelip but it is often referred to as being applicable for closure of wounds following excision of cancer of the lower lip No old illustrations could be found of its use on the lower lip and the drawing above is an adaptation from these old descriptions. As a matter of interest, this procedure was recently successfully employed in the Head and Neck Out Patient Clinic at Memorial Hospital for closure of a V-excision of cancer of the lower lip

reviewed the literature and classified 32 operations for lip cancer by 52 authors

As early as the seventeenth century several bolder surgeons published reports of attempts to excise cancer of the tongue usually by cautery (Figs. 3 4) or by a chain or wire *écraseur* (Fig 5) The first recorded attempt at removal of the tongue by cautery was by Marchette in 1664 followed in 1676 by Richard Wiseman who reported two such operations Series of continuous mass ligations were sometimes used to encircle a cancerous portion of the tongue and cause it to slough off by strangulation (Inglis and Home 1805) In the surgical texts of the eighteenth century there is frequent mention of glossectomy but one gets the impression that the vague descriptions are based more upon hearsay than upon personal experience Munro in 1792 stated that in cancer of the tongue surgery was applicable only in smaller growths, but added, "This being a formidable operation is seldom attempted" Langenbeck (1819) temporarily sectioned the mandible to provide exposure and for the same reason Sedillot (1866) split the lower lip and mandible in the midline (Fig 6) Kocher (1880) incised the submaxillary area to enter the mouth and deliver the tongue into the wound (Fig. 7)

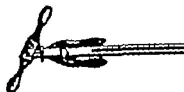
In the 1880's Butlin, Senn, Bland-Sutton and others began to report more frequent surgical successes. In the early 1900 s Dawbarn proposed ligation of the external carotid artery and its branches as the sole and supposedly adequate treatment for mouth cancer There were few reports of long-term survivals in mouth cancer and recovery from the operation with delayed healing was considered a triumph in itself Liston in his *Practical Surgery* (1837) briefly mentioned operations for tumors of the lip tongue jaws thyroid (bronchocele) and pa



3 Cauterization of cancer of the tongue The surgeon is grasping the tongue with a vulcellum forceps and applying a cautery (From an 18th Century French print.)



4 Excision of cancer of th appears to be standing behi grasping the tip of the tong using a scalpel with the righ tury French print.)



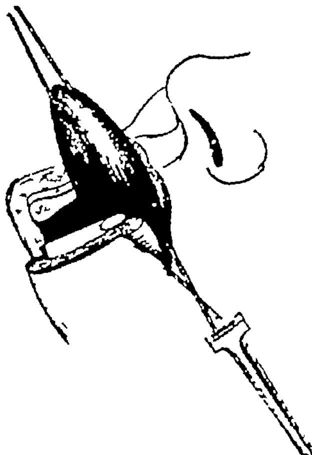
5 The chain écraseur (E ment, an elaboration of the ture, used either a cord a could be drawn tight by m provided for the more ra cutting through of the di tongue. (From Holmes, *Sur Practice* 5 677 1889)

rotid and of the latter spoke of the importance of the preservation of the 7th nerve

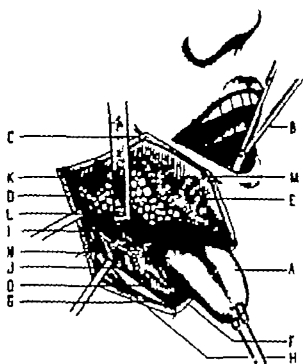
Up until the first quarter of the nineteenth century there were few reports of operations for cancer of the head and neck, except for the lip and tongue and from the present-day viewpoint it is plain why progress should have been so slow Lacking anesthesia, the pain and the inability to restrain even the most willing and cooperative patient would make the necessary manipulations difficult or impossible Liston in 1837 wrote, "None of the operations in the mouth or fauces can be accomplished without the full consent of the patient throughout the entire proceeding," which may be taken as a typical example of an Englishman's propensity toward understatement The discovery of anesthesia (ether 1842 nitrous oxide 1844 chloroform 1847) made painless surgery possible, but in the case of operations in the mouth and pharynx the cumbersome inhalation apparatus placed over the mouth and nose so obstructed the maneuvers of the surgeon that bleeding was even more difficult to control than before and

hemorrhage was always a thesia in the form of cocai until 1880 and the safer not until 1923

The Trendelenburg po some so that gravity wou



6 Sedillot's method for exposure of the tongue by splitting the lower lip and mandible in the midline A wire écraseur (crusher) is being used to amputate the tongue (From Erichsen's *Science and Art of Surgery* *1* 1008 (8 ed.) 1884)



7 Kocher's method for exposure of the tongue through an incision in the submaxillary area. Modern surgeons would find it somewhat difficult to see any particular advantage in this method over an approach through the open mouth. (From Bickham's *Operative Surgery* Vol. 3 Chap. 36 p. 477 1924)

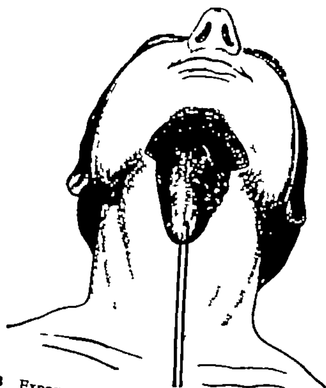
the aspiration of blood is not mentioned by the earlier authors

Surgical opening of the trachea to relieve respiratory obstruction is mentioned by Galen (A D 131–210) and after him by many surgical writers during the succeeding centuries The operation (usually termed *bronchotomy* or *laryngotomy* rather than *tracheotomy* or *tracheostomy*) was most often employed in quinsy and as a means of access for the removal of foreign bodies in the larynx and trachea *

The problem of feeding was obviously great since there was no understanding of the simplicity and practicality of a naso-esophageal feeding tube and little understanding of the make up of an adequate diet Even if the operations themselves were immediately successful sepsis—local bronchial pulmonary and general—was inevitable The operative mortality from "exhaustion general sepsis and hemorrhage" (as the reports a century ago expressed it) was almost prohibitive

With better understanding of the clinical character of mouth cancer surgeons about the middle of the nineteenth century began also to emphasize the necessity for removal of what were referred to as "metastatic glands" There was no clear understanding as to what was meant by the term glands" It is obvious that most physicians indiscriminately lumped together the submaxillary salivary glands, the lymph nodes and even the thyroid gland under such a term and it was apparently assumed that cancer spread into these glands. In any case, surgical treatment was by enucleation and it was not until about the turn of the century that Crile called attention to the fallacy of such local removal He wrote "Excision of individual lymphatic glands as one would excise a tuber

* Louis, in the latter part of the eighteenth century published a lengthy discussion on "bronchotomy including a variety of indications for tracheostomy and case reports. Curiously enough, while he makes no mention of cancer as a cause of respiratory obstruction, he relates apocryphal stories of surreptitious prophylactic tracheostomies in criminals about to be hanged.



8 Exposure of the tongue by Regnoli's method. Although this illustration was widely published in surgical literature throughout the nineteenth century from the present day standpoint this manner of exposure of the anterior portion of the tongue appears to have little advantage over an approach through the open mouth. (From Ashurst's *Principles and Practices of Surgery* 6 ed., Philadelphia, 1893 Lea.)

cular gland, not only does not afford permanent cure but is usually followed by greater dissemination and more rapid growth." Nevertheless the ancient and illogical practice of enucleation of individual metastatic lymph nodes persists today in some quarters especially in the treatment of thyroid cancer

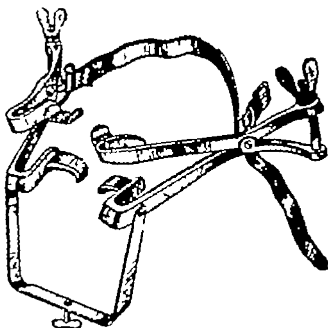
Cancer of the skin including that of the face, was seldom diagnosed and treated early In its earlier stages it was often confused with other ulcerative lesions (syphilis leprosy and tuberculosis) and therefore neglected, while treatment by escharotics—arsenic zinc etc (Arnott, 1858 Bright, 1871)—was commonly employed rather than surgery Marsden who founded the Royal Cancer Hospital (London) in 1851 stated that the policy of that institution as regards all superficial cancers was, 'Whenever possible to employ caustics or otherwise avoid the use of the knife "

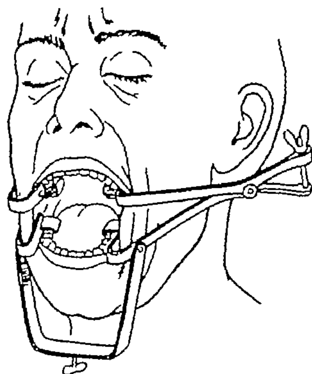
Liston in the early 1800 s stated, "The patient with cancer of the antrum may be numbered with the dead," and that its surgical treatment "is totally inadmissible it is a piece of unmeaning and entirely useless cruelty " As late as 1908 Mosher referred to operations for cancer of the paranasal sinuses as "palliative" only

Partial laryngectomy (through laryngofissure) for cancer was first reported by Gordon Buck in 1853 He used no anesthetic H B Sands reported the use of ether in this operation in 1865 A review of the literature of this period shows that the immediate and postoperative mortality in laryngofissure was high—in the neighborhood of 30 per cent. The cases were poorly selected and because of the advanced stage of the disease cures were seldom if ever obtained. The tracheostomy tube was commonly left in place permanently and therefore if it failed to cure the operation had little to recommend it over simple tracheostomy Although the procedure had some ardent advocates Paul Bruns in a review of the literature published in 1878 concluded that "The attempt at radical extirpation of cancer of the larynx by means of thyrotomy has proved itself completely unsatisfactory and worthless " It was not until the 1890 s and the early part of the twentieth century that the operation came into favor

Billroth is credited with having performed the first successful total laryngectomy for cancer In 1873 The patient died of recurrence eight months later The operation at first was not received with great favor and in 1887 MacKenzie successfully opposed its performance in the celebrated case of Emperor Frederick III of Germany His ostensible reason was that no positive biopsy had been obtained but a review of MacKenzie s publications suggests that he had no great faith in the radical operation since he scarcely mentions it. In 1880 after a review of the literature up to that date, MacKenzie concluded gloomily that in cancer of the larynx, "Our aim must be to prolong life when possible and in every case to promote euthanasia when the inevitable end draws near " *

* Judging by newspaper articles in recent years, one must conclude that the meaning of the term *euthanasia* has become restricted in popular usage to the definition given in the current edition of "Webster s New International Dictionary" as *an act or practice of painlessly putting to death persons suffering from incurable and distressing disease* In earlier printings of the dictionary (e.g., 1934) the first—and (one must presume)



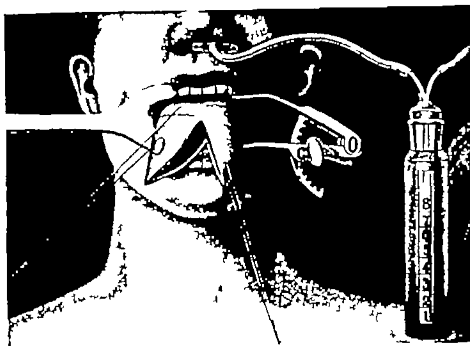


9 At the left is a reproduction of Wood's mouth gag (circa 1800) for operations on the tongue. At the right is my own and my artist's joint conception of its application to a patient. The present day surgeon might find it somewhat difficult to understand how even the most trusting patient could have been induced to let the contraption be applied while conscious, and surely it would have been interesting to observe the operation without anesthesia, which followed.

Gluck in the 1880's was a strong advocate of total laryngectomy and even attempted pharyngolaryngectomy comparable in some degree to the extensive operations performed today. The mortality of total laryngectomy in the 1880's and 1890's was vividly described by Gluck who wrote "A normal course surely was seldom seen by the older authors erysipelas phlegmon, secondary hemorrhage, mediastinitis bronchitis and septic bronchopneumonia sepsis acutissima (septicaemia) shock particularly dilirium cordis and insufficienta cordis with consecutive paralysis of the heart, carried off the patients, so that a mortality of 25 per cent after these several operations was really at the time too low a figure statistically." As further evidence of the pessimistic attitude during the 1870's and 1880's toward malignant tumors of the larynx two of the leading authorities (MacKenzie and Mandl) each published textbooks on diseases of the larynx with only passing references to cancer and its treatment.

In 1908 Hartley described the technic of both partial and total laryngectomy including a staged operation with a temporary pharyngostome and methods for secondary plastic closure. He used chloroform as the anesthetic and advised "enucleation" of enlarged "glands." He reported the mortality of laryngectomy in the late 1880's as being 44 per cent—a figure which von Bruns later claimed to have reduced to about 4 per cent in a series of 22 cases. In 1926 MacKenty also reported an operative mortality of about 4 per cent in over 100 cases—a truly remarkable figure for that era. Irwin Moore writing in 1921 on the operation of laryngofissure, barely mentions total laryngectomy and apparently had never himself performed the operation. A perusal of the numerous publica

the chief—meaning was given as *an easy death or a mode of dying to be desired* and the *act of putting to death* being given as the second definition. The reversal of stress suggests that there has been a change from its earlier meaning; and to MacKenzie *euthanasia* signified the less drastic relief of suffering in the terminal stages of cancer by palliative care and the liberal use of sedatives and narcotics. The assumption must be that he did not refer to the *act of putting to death* which at present is a highly controversial matter from the moral and legal standpoints.



10 Whitehead's operation for excision of half of the tongue. The inhaler for the anesthetic, the mouth gag, and the cheek retractor all have a relatively modern appearance. (From Erichsen's *Science and Art of Surgery* Vol 1 8 ed., 1884)

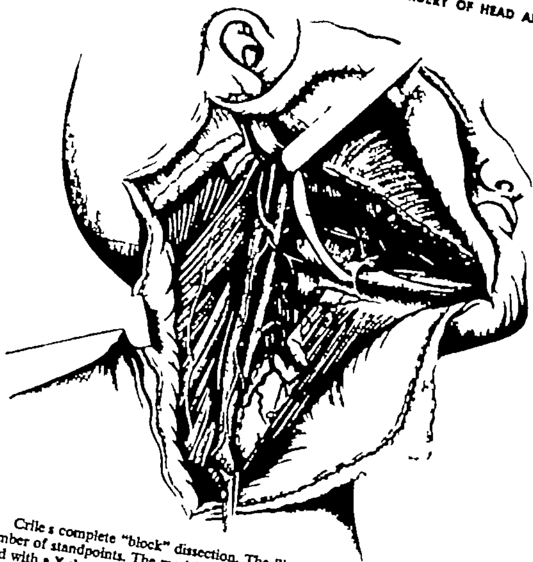
tions of Chevalier Jackson and St Clair Thomson will reveal that even the succeeding generation of surgeons in the first quarter of the twentieth century placed little emphasis upon total laryngectomy though they employed partial laryngectomy (through laryngofissure) quite extensively

Total laryngectomy had been performed at Memorial Hospital in at least a few cases before 1920 but with the acquisition of about 4 grams of radium in solution in 1917 and 1918 the policies of the institution, long in the making, shifted definitely to favor radiation therapy rather than surgery for many forms of cancer including that of the larynx As a result no laryngectomies were performed at Memorial Hospital for about fifteen years and it was not until 1933 that the operation again came into use *

At about the turn of the last century one of the most inventive and courageous surgeons of that era—George W Crile—developed a variety of radical operations for cancer of the mouth, pharynx, and larynx. He was the first to realize that for the treatment of cervical metastases an *en bloc* resection should be made of the lymph-node–bearing tissues of the neck, including the internal jugular veins and the submaxillary salivary glands in both instances because of their intimate association with the lymph nodes.†

* I can well remember in the early 1920's marveling at the first laryngectomee that I had ever seen. The patient, Violet D., an actress, had been successfully operated upon by the late H. H. Janeway about 1917 or 1918 She developed an excellent esophageal voice and I subsequently followed her regularly in the Out Patient Department well into the 1930's. At that time, MacKenty was the only surgeon in the New York area to perform total laryngectomies frequently In the early 1920's it was rather widely believed, especially at Memorial Hospital that radiation therapy would entirely replace surgery in the treatment of cancer As an ambitious young surgeon I can recall at that time regretting that I was born too late to ever have the opportunity to perform this operation which seemed to me to have so many fascinating possibilities. The belief in the 1920's that a total laryngectomy was an outmoded operation has proved to have little foundation The operation is being performed in about 1500 cases in the United States annually and during the last several years my associates and I at Memorial Hospital have performed it in well over 100 cases annually

† For many years the following statement made by the late George W Crile, Sr was quoted widely as an argument for neck dissection in mouth cancer "We shall base our arguments largely upon the assumption that cancer is primarily a strictly local disease that therefore accessible cases are at some period curable by complete excision and that the immediate extension from the primary focus is through the regional lymphatic system. By a careful study of 4,500 cases from their original report in literature, made for me by



11 Crile's complete "block" dissection. The illustration is interesting from a number of standpoints. The modified form of T incision appears to have been used with a Y-shaped extension posteriorly The upper flap has been dissected off the lower face and the platysma excised along the lower edge of the mandible thereby certainly sacrificing the ramus marginalis mandibulae. The sternomastoid muscle, the posterior belly of the digastric and the omohyoid muscles have been resected. The sternothyroid muscle is absent, and the thyroid lobe exposed The common carotid artery is shown branching at the junction of the middle and lower third of the neck. There can be little question but that the operation conforms closely to the modern standards of neck dissection. The several divergences from anatomic facts are undoubtedly faults of the artist, who was probably making a record of this form of exposure for the first time. (From Crile G W., *Excision of cancer of the head and neck With special reference to the plan of dissection based on one hundred and thirty-two operations* J.A M.A. 47 1906)

Dr Hitchings, in less than 1 per cent have secondary foci been found in distant tissues or organs." Crile interpreted these figures to prove that in cancer of the upper respiratory and upper alimentary tracts the disease remained localized above the clavicle in 99 per cent of the cases even up to the time of death. After an unsuccessful search of the literature for any published report of Hitchings I finally wrote to Crile asking for specific information concerning Hitchings the source of his material, and such data that would aid in substantiating these figures.

In April, 1940 Crile answered as follows "Regarding Dr Hitchings, I can only say that he was a Harvard man, with excellent training. He was always most scholarly and thorough in his work, and painstaking in his desire for accuracy Unfortunately he died a few years ago, so I can not think of any way in which you could check his figures." The inability to check the accuracy of Hitchings observations, together with our clinical observations that systemic metastases occurred much more frequently led us to investigate the autopsy records

He advised resection of the sternomastoid muscle to provide better exposure (Fig. 11) To reduce hemorrhage at operations on the mandible and within the mouth Crile practiced ligation of the external carotid artery and sometimes temporary ligation of the common. He proposed a two-stage operation for total laryngectomy—the first stage intended mainly to "vaccinate" the patient against the hazards of fatal sepsis for the second stage, at which the larynx itself was removed The same reason led Portmann later to advocate a staged operation as a routine leaving a pharyngostome at the first stage to be closed later by a plastic procedure Hartley had mentioned this technic in 1908

Crile occasionally combined neck dissection with resection of a primary lesion in the mouth, but found the mortality rate so prohibitive that he finally limited these combination operations to those cases where the primary lesions were in the floor of the mouth and gum He employed a nasotracheal breathing catheter with packing of the pharynx, for inhalation anesthesia. Despite Crile's courage and imaginative genius, he could not cope with the unavoidable surgical hazards of his day and his published mortality rates of fifty years ago were about 13 per cent, even in operations of moderate extent such as simple neck dissection and total laryngectomy

As recalled by the present author surgery of the head and neck for cancer at Memorial Hospital during the 1920's and 1930's was considerably different from that of the present day Although neck dissection was carried out along the general lines established by Crile in the early 1900's, with resection of the sternomastoid muscle the internal jugular vein and the contents of the submaxillary triangle, there was, nevertheless a tendency to apply a variety of rationalizations for operations that by present day standards were obviously incomplete, that is many "submaxillary dissections" "suprahyoid dissections," etc were carried out for clinically obvious metastases but even then the so-called "prophylactic" neck dissections were not greatly favored

During the 1920's and 1930's the only available general anesthetics were the inhalants administered either by the open cone or by the face mask. Rectal ether was occasionally used, but it was considered difficult to control and dangerous In those days general anesthesia for more extensive operations in the mouth pharynx, or neck was only rarely used at the Memorial Hospital For such procedures as neck dissections and operations within the mouth and on the face, the presence of the anesthetist's apparatus in the operative field was so great a disadvantage and the incidence of postoperative pneumonia was so high that neck dissections and most other major procedures were usually performed under local anesthesia, a practice which was continued until the advent of intravenous anesthesia in the late 1930's It can easily be appreciated that to perform a neck dissection under local anesthesia the surgeon had to work slowly and meticulously beginning with an attempt to block the cervical plexus at the mid-point of the posterior border of the sternomastoid muscle then adding local infiltration along the lines of skin incision and along the plane of the platysma in order to lay back the skin flaps. For the deep tissues, care had to be taken to inject each trunk of the cervical plexus as it was exposed. Even with heavy sedation the operation was painful to the patient and exhausting for both him and the surgeon. The time required for a neck dissection under such conditions, even for the most rapid operator could hardly be less than three to four hours and in the more apprehensive and less cooperative patient it took even longer

In many major head and neck operations success depended as much upon the proficiency of the surgeon in giving local anesthesia as it did upon any other factor in surgical technic, but nevertheless local anesthesia was preferable to the nuisance and the hazards of a general anesthetic. Effective conduction anesthesia was limited in practice to the second and third divisions of the fifth nerve and to operations on the upper and lower lips and anterior tongue All factors being considered, local anesthesia was preferable for total laryngectomy Strange to relate, local anesthesia was less of a problem in total than in partial laryngectomy (*laryngofissure*) In the latter operation, general anesthesia (chloroform) following the technic described

at Memorial Hospital. In 1941 Braund and I reported on the autopsy findings in 284 cases of patients dead of head and neck cancer and found an over-all *incidence of* 23 per cent of systemic metastases. In the final analysis, however the faith in the curative value of neck dissection is valid without such arguments as those advanced by Crile.

by St. Clair Thomson, was fairly successful. Laryngofissure under local anesthesia was extremely difficult because of the uncontrollable tendency of the patient to swallow—an act which if repeated every few seconds kept the operative wound bathed in a flood of saliva and blood Chloroform permitted rapid recovery of consciousness Deep ether anesthesia followed by a tendency to sleep for an hour or two with the blood trickling from the wound surfaces within the larynx and trachea, created a significant hazard

Radiation therapy was the method of election for the treatment of primary lesions within the mouth—sometimes being combined with cautery or endothermy excision either shortly after the introduction of interstitial radon or after a longer interval when radionecrosis had developed For such operative technics local anesthesia was usually inadequate, and ether because of its explosive tendency was considered unsafe Therefore chloroform was employed, the surgeon operating during short intervals between applications of the anesthetic mask The wounds within the mouth were left wide open and the necrotic base soon became grossly infected and malodorous If the necrosis extended deeply in the radiated tissues hemorrhage was a common complication and the first or immediate expedient was local tamponage, which had the disadvantage of increasing laceration of tissues and extending the necrosis. The next step in the prophylactic or curative control of such hemorrhage was ligation of one or both of the external carotid arteries As a matter of fact such arterial ligation was one of the most commonly performed operations but often failed to control hemorrhage arising in the pharynx In the latter cases ligations were sometimes performed on branches of the thyroid axis

Since most growths within the pharynx or larynx were treated by radiation respiratory obstruction was a common complication patients often arriving at the hospital in an advanced state of asphyxia Emergency tracheostomies were occasionally performed in such places as the Board Room or just within the front door of the hospital

There was no realization of the value of early ambulation. As a matter of fact, complete postoperative bed rest was thought to reduce the risk and patients were usually kept in bed for four to six days following a general anesthetic, and for 48 hours following even a minor procedure under local anesthesia.

Before the days of the sulfa drugs and antibiotics, the incidence of wound infection was high even in such clean operations as neck dissection. The most frequent cause of death was bronchial pneumonia, for which there was no specific remedy Breakdown of the wound was almost inevitable in total laryngectomy as MacKenty realized when in 1926 he sadly confessed that "I have put behind me the ambition of securing primary union. " In partial laryngectomy (through laryngofissure) the greatest hazard was hemorrhage developing from local necrosis within five to seven days after operation

Primary surgery was never performed for cancer of the paranasal sinuses, but after prolonged radiation therapy by fractionated x-ray and interstitial radon antrostomy was commonly performed for drainage of the almost inevitable septic abscess within the antrum

In brief surgery of head and neck cancer during the early 1930 s was associated with the same hazards of inhalation anesthesia, uncontrollable hemorrhage, and uncontrollable sepsis, both at the operation and in the postoperative period as had been the surgery of 100 years before

Development of Combination Operations. On the Head and Neck Service at Memorial Hospital during the 1920 s and early 1930 s, resection of the mandible was performed mainly in cases of radiation necrosis and osteomyelitis and occasionally for primary tumors of bone Such operations were usually performed through the open mouth so as to obviate as much as possible the complication of large salivary fistulas With the advent of the sulfa drugs in the middle 1930 s, resection of the mandible for invasion of the bone by cancer could be performed through an incision in the submaxillary region with a reasonable chance of primary or only slightly delayed healing

In the late 1930 s such operations were sometimes combined with neck dissection and with the advent of the sulfa drugs and penicillin the proportion with primary healing increased In our first combination operations in 1938 the lower lip was not split in the midline but in the early 1940's it became routine to split the lower lip and lay back a cheek flap for access to the primary lesion within the mouth and while our first attempts were limited mainly to cancer of

the gum the operation was gradually extended to include the excision of primary growths of the mucosa of the cheek, the floor of the mouth, tongue (including the base), and the tonsillar area With the continued success in primary healing in these cases the combination operation (Commando)* was extended to growths of the pharynx and larynx.

RECENT ADVANCES PERMITTING RELATIVELY SAFE RADICAL SURGERY OF THE HEAD AND NECK

In the later 1930s and early 1940s several important surgical aids appeared in rapid succession to release radical surgery of the head and neck from the hazards that previously had been such strong deterrents This in turn permitted the unhindered development of radical surgery of the mouth, pharynx, and neck—procedures often requiring operative wounds extending from the level of the zygoma to the clavicle, frequently opening widely into the mouth and pharynx First, with the help of the sulfa drugs and later of the antibiotics, the unavoidable grossly contaminated wounds usually healed promptly Second intravenous Pentothal anesthesia obviated the mechanical nuisance of the cumbersome inhalation apparatus and favored the development of such devices as endotracheal breathing tubes The latter apparatus permitted adequate respiratory exchange with complete sealing off of the operative area in the mouth and pharynx from the tracheal bronchial tree Third blood banks made possible the complete replacement of the blood loss if so desired. Fourth, the drum dermatome (Paget, Reese etc) made possible split grafts of adequate size and uniform thickness for the complete epithelial covering of extensive raw surfaces in maxillary orbital and other defects

Released from the previous hazards and deterrents radical surgery in this part of the anatomy is steadily progressing, as new and more extensive procedures are being devised calling for the modification of old apparatus and instruments and the development of new ones. At the present time the permissible limits of radical surgery of the head and neck are determined only by the necessity of preserving structures essential to the patient's life Such considerations differ markedly from those of former days, when the deterrents were mainly the hazards of such complications as shock asphyxia blood loss uncontrollable infection, and an extended morbidity due to the failure of prompt healing At the present time it may be anticipated that even after the most radical operation on the head and neck the patient will be out of bed the following morning, and after healing by primary union may be discharged within one or two weeks.†

* At Memorial Hospital resection of a primary lesion within the mouth, including a portion of the mandible combined with a radical neck dissection at the same operation, was being extended and regularly performed on our service by 1942, the year of the Allied *Commando* raids on Dieppe. For want of a short, better designation, the house staff then began to refer to this type of operation as a "Commando," and this generic term has persisted in the form of "Commando—floor of mouth," "   —tongue," "   —cheek," "   —larynx," etc. Although this term may be justifiably criticized as being nondescriptive, nevertheless there is no short and convenient alternative available for ordinary daily use. Such cumbersome phraseology as "Resection of cancer of the floor of the mouth combined with partial resection of the mandible, radical neck dissection and tracheostomy" may be necessary for posting on the operating room schedule and for statistical reporting, but is obviously rather unwieldy for ordinary daily use. To many of us the short and convenient term *commando* enjoys the additional merit of chronological and historical significance. If a more descriptive and equally short substitute is ever discovered, the term "commando" will obviously and deservedly fall into disuse.

† Only those surgeons whose experience spans this transition period can appreciate the impact of the sudden dramatic changes in the prevention and/or control of surgical sepsis and postoperative pulmonary complications as the result of the sulfas and penicillin For example, in total laryngectomy healing by primary intention without salivary fistula now often took place. After partial laryngectomy there had always been a risk of hemorrhage 4–7 days after operation due to septic necrosis of the raw wound surface within the larynx. In such cases, the aspiration of blood and bronchopneumonia were inevitable. With the new facilities, prompt healing was the rule.

In the early 1940s the sulfa drugs were often applied locally in operative wounds in many types of surgery before a closure, a practice soon discarded These chemicals, especially sulfathiazole, were not sufficiently soluble to be taken up promptly and, as a result, produced rather intense local chemical reactions as well as acting as foreign bodies. I can remember having to open, several days postoperatively a wound of a neck dissection into which I had liberally applied sulfathiazole. The local appearance was that of a wound filled either with sand or ground glass. Penicillin was expensive and difficult to obtain but nevertheless was sometimes applied locally with indifferent results.

by St Clair Thomson, was fairly successful. Laryngofissure under local anesthesia was extremely difficult because of the uncontrollable tendency of the patient to swallow—an act which if repeated every few seconds, kept the operative wound bathed in a flood of saliva and blood. Chloroform permitted rapid recovery of consciousness Deep ether anesthesia, followed by a tendency to sleep for an hour or two with the blood trickling from the wound surfaces within the larynx and trachea, created a significant hazard

Radiation therapy was the method of election for the treatment of primary lesions within the mouth—sometimes being combined with cautery or endothermy excision, either shortly after the introduction of interstitial radon or after a longer interval, when radionecrosis had developed For such operative technics local anesthesia was usually inadequate and ether because of its explosive tendency was considered unsafe Therefore chloroform was employed, the surgeon operating during short intervals between applications of the anesthetic mask The wounds within the mouth were left wide open and the necrotic base soon became grossly infected and malodorous If the necrosis extended deeply in the radiated tissues, hemorrhage was a common complication and the first or immediate expedient was local tamponage which had the disadvantage of increasing laceration of tissues and extending the necrosis The next step in the prophylactic or curative control of such hemorrhage was ligation of one or both of the external carotid arteries As a matter of fact such arterial ligation was one of the most commonly performed operations, but often failed to control hemorrhage arising in the pharynx In the latter cases ligations were sometimes performed on branches of the thyroid axis.

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Chapter 2

PREOPERATIVE CONSIDERATIONS

When the sacrifice of important (not necessarily essential) anatomic structures is proposed, the necessity of and justification for such extensive surgery is sometimes questioned. Though it may entail considerable cosmetic and functional disability radical surgery in advanced cancer is surely warranted, provided that the operative mortality is not inordinately high and that in the healed state there is a reasonable degree of comfort, together with the preservation of the vital functions such as breathing, the taking of nourishment and at least, partial vision Too often, perhaps the surgeon, without reference to or regard for the opinion and ultimate welfare of the patient and his family may rule that in a given case an extensive surgical procedure is "too radical" and therefore unjustifiable It is neither logical nor reasonable for a doctor alone to decide for the patient that certain death from cancer is preferable to a fair chance of life without a larynx, tongue palate mandible or an eye Most intelligent and thoughtful patients, when given the opportunity of making an informed choice after being presented with the actual facts in the case will decide on the chance for life even though the decision involves the acceptance of considerable disfigurement or the loss of one or more of such important functions as normal speech or binocular vision

The term *inoperable* has long been used by surgeons to designate those cases of cancer in which it is believed that the growth cannot be completely removed by surgery In my opinion the term is not well chosen, for certainly any patient can be operated upon perhaps with palliative effect, even though part of the growth must be left behind. The question is rather whether the patient can be benefited in any way by an operation. My associates and I prefer the terms *resectable or nonresectable* for such situations Too often the designation *inoperable* suggests a tacit admission by the surgeon of his own limitations in skill and courage *

The foregoing discussion is not intended to minimize the importance of minor or conservative surgical procedures in the treatment of head and neck cancer Many selected cases of serious head and neck cancer can be treated adequately by conservative or even minor surgical procedures. Under present-day conditions however such conservative operations should be elected because they are suited to the given case rather than—as formerly—because a more extensive procedure would be too hazardous. Recent years have permitted the untrammeled development of better technics for these extensive procedures, whose main disadvantage in former years was the hazard of local postoperative sepsis, now almost completely eliminated by the routine postoperative administration of antibiotics

PLANNING THE OPERATION—SELECTION OF THE OPERATIVE PROCEDURE

The operation selected for a given case should obviously be that which is most likely to insure the extirpation in a single effort of the whole of the tumor and its adjacent regional metastases Two-stage operations should be avoided, if possible It goes without saying that if a con-

* One is reminded here of the reply of the president of a small private bank in the South to a depositor who objected to having a check returned stamped "No funds." The president answered, "When we stamps a check *No funds* we only means that just now we've got no money in the bank to pay it with."

servative and a radical operation for cancer are equally likely to provide a cure, then the conservative operation, with its lessened operative risk postoperative morbidity and cosmetic and functional defect, is to be preferred However, a fair-minded audit of a series of unsuccessful operations for cancer will in the majority of cases indicate that the first surgeon was in error, not because he performed an unjustifiably radical operation, but rather because the first procedure was too limited in its scope In such cases it must be conceded that the patient s chances for cure were lost or at least, markedly lessened because the first surgeon was unwilling to propose and to undertake the more radical procedure. Examples of this may be found in such situations as a too narrow excision for cancer of the tongue or the lip the excision of a cervical node rather than a radical neck dissection the performance of a partial laryngectomy in the case of a growth too far advanced for any operation except total laryngectomy A much longer list of similar situations could be made

To some extent, the initial treatment of cancer in any part of the body by either surgery or radiation is an "all or nothing" proposition. It is the responsibility of the therapist to select and apply as the initial therapy that method and particular technic which will give the greatest chance of cure rather than to try a conservative method in the hope of being able to adopt the more radical procedure if the first fails

To this end the surgeon must not be too greatly influenced by the hesitation of the patient or his family who are naturally inclined to accept with relief the suggestion of a conservative rather than a radical procedure If in the opinion of the surgeon a radical operation—including possibly the sacrifice of the larynx (loss of normal speech) one eye (sacrifice of binocular vision) mandible (sacrifice of cosmetic appearance) or tongue (sacrifice of normal articulation and mastication)—is necessary for cure he must firmly hold to the proposition that such a radical measure is in the patient s best interests

Local as Compared to Total Excision of an Anatomic Part In the previous discussion emphasis has been placed upon the necessity for a radical approach where indicated in order to promote cure On the other hand by a judicious selection of cases a local excision will often serve as well as the more radical operation In the operative procedures which are included under Part 2, many examples will be found of small or moderate sized lesions that may be locally excised with reasonably safe margins, to provide about as good a chance of cure as would more radical excisions, without the latter s greater functional and cosmetic damage One cannot draw a clear line of differentiation between lesions suitable for local and for radical excision. Cancers of the tip and lateral borders of the tongue are obviously more suitable to local excision than those that extend into the floor of the mouth or deeply into the substance of the tongue or backward toward the base In the mucosa of the cheek a tendency toward an indistinct border and to infiltration of the underlying muscle is the most definite contraindication to conservative local excision The greater proportion of parotid tissue and the greatest incidence of parotid tumors are in the superficial rather than in the deep retromandibular lobe For this reason, partial excision of the parotid along with the tumor with preservation of the nerve will be found suitable in a great majority of cases In the larynx, lesions of the anterior two thirds of the vocal cords not extending beyond the anterior commissure and not deeply invading the ventricle will be found most suitable for partial laryngectomy Subglottic lesions or those arising from and extending into the subglottic portions of the larynx call for total laryngectomy since in such situations there will be considerable risk of local recurrence after partial laryngectomy

Resection of an Adjacent Anatomic Structure. In cases of cancer of the paranasal sinuses or the base of the tongue, the question often arises as to whether the growth can be adequately excised without removal of the eye or the larynx respectively Indications for the sacrifice of such adjacent parts are several

In a high proportion of cases of cancer of the paranasal sinuses, the growth will be found to invade the floor of the orbit or the ethmoid cells, and while there may be no suspicion of invasion of the globe by cancer adequate removal of the growth may necessitate wide resection of the roof of the antrum (floor of the orbit) In this case, lacking any support, the globe would tend to prolapse into the operative defect, throwing it completely out of alignment with the opposite eye and resulting in diplopia and loss of useful function. The presence of a

deep and infected wound just below the globe itself would tend to result in panophthalmitis In this type of case there is also either definite or suspected involvement of the ethmoid cells If the latter are to be exenterated the mesial wall of the orbit must be resected for access to the ethmoids would be difficult or impossible with the globe in place These facts supply in my opinion, sufficient reason for sacrifice of the eye in radical resection of the maxilla for cancer of the paranasal sinuses Except in lesions clearly involving only the anterior lower aspects of the maxilla and antrum the more conservative operation leaving the floor of the orbit and eye intact, cannot be justified.

Certain growths of the base of the tongue (either primary or postradiation) may leave a fairly clear zone of uninvolved tissue between the base of the tongue and the epiglottis, and in such cases subtotal glossectomy may be performed retaining the larynx intact. In others, because of the necessity of leaving a free margin, or as a result of previous radiation, or because it will almost certainly be necessary to sacrifice the superior laryngeal nerve the wisdom of leaving the larynx intact may be questioned because of the risk of local recurrence as well as of aspiration of secretions and ingesta through the glottis. In such cases a larynx uninvolved by cancer may justifiably be sacrificed in order to preserve life *

Excision of Bone Discussion will be found elsewhere as to the indications for excision of the mandible and of the maxilla Loss of part or all of the mandible obviously results in moderate to marked functional and cosmetic defects A definite decision must be made therefore, when the operation is planned and no better examples of the principle of "too little and too late can be found than those cases in which the surgeon is unwilling to accept the responsibility of proposing a radical form of operation.

Operations on the paranasal sinuses will in all cases involve the resection of some bone of the alveolus and palate, a defect which can be readily relieved by surgical prostheses as described elsewhere

Extraction of Teeth. Operations involving the maxillae or mandible will almost always necessitate extraction of teeth unless the patient is edentulous These extractions may involve only two or three teeth and the time required is usually so short and the need so uncertain that it is hardly practicable to have a dentist scrubbed up as part of the operating team in all cases The head and neck surgeon should, therefore acquire a reasonable degree of skill in exodontia although in multiple extractions or in difficult cases the assistance of a dentist, either preoperatively or during the operation, may be advisable In the Instrument List (Appendix A) there will be found a description of a *Dental Set* which should be packaged sterile so that it may be called for whenever required. In the standard Dental Set in our clinic, each instrument is marked so as to guide the surgeon in the selection of the proper forceps

Preoperative Working Models for Postoperative Prostheses. Prior to any operative procedure, it may be useful to make models of the upper and lower jaws to be used as a basis for postoperative construction of stents splints, and prosthetic restorations

Extent of Neck Dissection. In the surgical literature of the past fifty years the operation of neck dissection has been variously referred to

* From the purely philosophic point of view the question may be raised as to whether surgery involving the loss of both tongue and larynx can ever be worth while from the patient s point of view At first thought the average person in good health would probably answer that death is preferable to such a deformity and loss of function. My own observations, however have convinced me that a person in good health cannot conceive of the strength of the will to live under even the most difficult circumstances. The following are two cases in point

The president of a large chain store corporation survived 14 years and a series of over fifty operations, in most of which recurrent cancers originating in the gum were excised For the last seven years he was without a lower jaw and lip, tongue, larynx, and internal jugular veins. Two years before his death one common carotid artery had to be sacrificed. Despite these disabilities he remained mentally and physically active, retained the office of president of his firm, and was an ardent fisherman.

In the second case, a physician ten years ago suffered a similar loss of the tongue, lower jaw and lip, larynx, and both internal jugular veins after a series of ten operations for recurrent cancer of the floor of the mouth. He survives to this day retired from practice, an ardent fisherman, and he is philosophically grateful that he has lived to see his son graduate from medical school, finish his postgraduate training, and enter medical practice.

With vivid memories of cases such as these, the cancer surgeon hesitates to withhold any surgical operation compatible with a reasonable chance of cure and fair comfort if it is the only alternative to death from cancer

as, for instance, "radical neck dissection " "submaxillary dissection " or "supraomohyoid dissection." Some surgeons have advocated all of the above operations the selection depending upon the supposed indications in the given case Each of the above mentioned terms has been interpreted variously so that by "radical neck dissection" one surgeon may mean a procedure which nevertheless preserves the sternomastoid muscle or the internal jugular vein or the submaxillary salivary gland, or even all three To most surgeons the latter term means the sacrifice of all three of the above mentioned structures Some surgeons while resecting each of these structures, may extend the operation of radical neck dissection no further down than the omohyoid muscle while others refer to the latter operation as a "supraomohyoid dissection " With a greater exchange of information and experience, it is certain that eventually these differences in terminology and practice will be satisfactorily resolved

One of the more troublesome aspects of this confusion is the acceptance by some surgeons of a number of different standard procedures for neck dissection and the promotion of the idea that one or the other of these partial procedures may be indicated in certain situations It is my opinion that there is only one logical form of neck dissection the complete operation extending from the lower edge of the mandible to the clavicle from the anterior edge of the trapezius to the midline and the removal of all the tissues between the platysma and the deep fascial layer with the exception of the common the internal and the external carotid arteries, the vagus and phrenic nerves, and the trunks of the brachial plexus. The following structures should be routinely removed the sternomastoid muscle omohyoid muscle, internal jugular vein, accessory nerve, and submaxillary salivary gland The following structures may be sacrificed if there are specific indications in the given case the external carotid artery (and even the common carotid in certain cases) a lobe of the thyroid the strap muscles the tenth and twelfth nerves, and the lingual branch of the fifth as well as a portion or all of the mandible

In my opinion, it is no more logical or tenable to propose any form of partial neck dissection than it is to advocate a partial axillary dissection or partial groin dissection in the treatment of cancer The erroneous idea that the preservation of the internal jugular vein in radical neck dissection contributes in any manner to the welfare of the patient is gradually becoming obsolete. There still remains however a fairly widespread opinion that the preservation of one internal jugular vein is indicated in bilateral neck dissection. It is my opinion that the indication for removing the second internal jugular vein in a bilateral neck dissection (either simultaneous or staged) is the same as for the removal of the first vein Experience in the Head and Neck Clinic at Memorial Hospital has shown that there is no increase in postoperative mortality or disability that can be ascribed to the removal of the second internal jugular vein

The "Forgotten Zone " Based upon what seems to me to be a rather narrow perspective, it has been proposed recently that the range of the standard radical neck dissection as outlined in Figs 79–86 should be extended so as to include the excision of a number of additional structures which are regarded as making up the "forgotten zone " These additional structures include the suprahyoid and infrahyoid muscles, the hyoid bone, the hypoglossal nerve and portions of the external carotid artery and its branches The proposition seems to me to be illogical in that it is surely unsound to hold that the resection of such ribbon-like structures as the above-mentioned muscles, the hyoid bone and the hypoglossal nerve would contribute greatly to the completeness of the operation, when such adjacent structures as the common carotid artery the vagus nerve, and the scalene muscles which are much more often invaded than the ribbon muscles, the hyoid bone and the hypoglossal nerve are left in place

A proper perspective based upon clinical experience would favor the standard neck dissection as a basic routine—the indication for the resection of any additional tissues being based on specific factors in the individual case If there should be gross evidence of involvement of any specific anatomic part, such as the common carotid artery vagus nerve thyroid gland, or laryngeal cartilage then consideration should be given to the removal of all or part of any one of these structures—the justification for their sacrifice being based on a reasonably greater chance of permanent control as balanced against the attendant operative risk In brief, the impractical proposition that routine resection of the tissues of the so-called "forgotten

zone" is of significance is one of misplaced emphasis which serves only to confuse the unwary without contributing to the welfare of the patient.

Combination of Neck Dissection with Excision of the Primary Lesion As has already been stated, an operation for cancer of the head and neck should ideally encompass the whole primary lesion and adjacent regional metastases in a single effort. This will often necessitate an operation that combines resection of a primary lesion in the mouth pharynx, or larynx, and a radical neck dissection for palpable cervical metastases Although usually extensive and invariably grossly contaminated, the risk and morbidity of the operation are not unduly great

Such a combination operation (Commando) is indicated also in the absence of clinically palpable metastases when excision of the primary lesion in the mouth pharynx, larynx, or thyroid will necessitate opening the neck The reasoning here is that even though there is no clinical evidence of cervical lymph node involvement, once entered surgically the neck becomes so scarred that a subsequent clean neck dissection would not be possible should later metastases occur Such a procedure should, nevertheless, not be classed as a "prophylactic" neck dissection—a term that should be reserved for an operation through a separate incision, not performed at the time of excision of the primary growth

Excision of the Primary Lesion Leaving an Open Defect for Later Closure Immediate closure of through-and-through wounds of the oral cavity and pharynx may not be possible following adequately wide excision of some bulky primary growths in the underlying mucosa that invade the subcutaneous tissues and skin. Such situations occur most often in cancer of the cheek the pharyngeal wall and larynx, especially when cancer persists after previous treatment either by radiation or surgery The impracticality of immediate closure should be considered in planning the operation so that the margin of safety may be generous It is sometimes possible to include the formation of a tubed pedicle skin flap at the same operation. In such operative wounds the skin and mucous membrane margins at the periphery of the defect should be approximated so as to eliminate the raw surface promote rapid healing, and reduce scar formation about the borders of the defect (Fig 275)

MEDICAL WORK-UP

When complete responsibility is assumed by the surgeon the preoperative medical work up in a given case will resolve itself mainly into a search for any systemic abnormality that might be corrected or ameliorated so as to prevent or minimize postoperative complications The general attitude toward such preoperative study was expressed by the late Jules Abels as follows "There are no medical contraindications to cancer surgery" This is an entirely reasonable policy since the principal disease itself (cancer) is always fatal if untreated. If when compared to alternate methods surgery (either conservative or radical) offers the best chance of cure then it is surely logical to accept a reasonable operative risk rather than the inevitable death from uncontrolled cancer

Preoperative medical investigation of candidates for extensive surgery should be placed in the hands of an internist with the understanding that he is to decide *when* within a reasonable time the operation had best be done from the medical standpoint, rather than *if* it should be done at all Obviously such a policy does not imply the performance of operations for cancer during an acute attack of another disease, or in patients in the terminal stages of cardiac or renal disease or general senile deterioration

With all due respect to the unquestioned value of a medical assay of the operative risk, the surgeon will often find that a patient relegated to "Class E" as a medical risk by the internist will withstand a radical procedure lasting several hours with no complications whatever while another found to be a preoperative "Class A" medical risk will unexpectedly die from a coronary attack, a cerebral hemorrhage, or barely survive one or more forms of strictly medical complications

THE PROBLEM OF OPERATIVE RISK

In some radical operations of the head and neck the question is not so much the loss or impairment of function of certain organs or structures as the risk of an immediate operative

mortality The surgeon himself must assume the main responsibility for this aspect of the problem The actual degree of operative risk in doubtful cases is admittedly a gamble When there is no alternative to certain death from cancer except radical surgery the hazards of postoperative mortality on the one hand, should be balanced against the chances of ultimate cure or at least worthwhile palliation on the other The decision is then made for or against the operation on the basis of a calculated risk mutually agreed upon By accepting the proposal of radical surgery (or radical treatment of any kind) the intelligent cancer patient s outlook is changed from the hopeless prospect of the certainty of death to the less forboding uncertainty of life The motto of the cancer therapist might well be a judicial and tempered *nil desperandum*

In unusually hazardous situations as, for example when the common or internal carotid arteries may have to be sacrificed in order to remove the disease totally the patient s family at least, should be informed of the specific nature and degree of risk and approval obtained. From the ethical and medicolegal standpoints, it is also proper and prudent that the surgeon obtain preoperative permission to remove such organs as the larynx or an eye

In any series of terminal cancer cases, there will be found a considerable number in which operations were refused (it is alleged) mainly because the patient would not accept the loss of what was considered a vital structure such as the larynx, the tongue the eye the breast, the rectum or an extremity and chose rather what was considered a less radical form of treatment such as radiation therapy While it must be conceded that radical surgery might also have failed to cure nevertheless in many of these cases the probabilities are that the chances of success were markedly reduced because of the inability to face what was considered too radical a proposal. The experienced doctor especially the surgeon will suspect that the original handling of the proposition in these cases was psychologically inept, and that the proposal was worded so bluntly as to invite refusal

Experience has proved that if the surgeon firmly believes in the soundness of his proposal and if when stating his case, he gives due consideration to the sensibilities of the patient, he will have few refusals of even the most extensive operations While it is obvious that some person in the family should be apprised of the facts—no matter how grim—the patient may well be approached more gently carefully avoiding such crude and tactless terms as, "take out your larynx" "remove your eye, or cut off your breast" Expressions like these and blunt references to cancer"—so often associated in the lay mind with the desperate connotations of hopelessness suffering, and death—may result in panic and a tendency for the patient and the family to "run for cover" to anyone (sometimes even to charlatans) who will offer what appears to them to be a less drastic solution of the problem

Many patients can face danger with less fear if they are spared the exact specifications of the risk In certain cases they will agree more confidently to such procedures as total laryngectomy or radical resection of the maxilla if they are sustained by the surgeon s promise that he will do his "best to save the larynx" or "the eye This is of course the truth for he would save it if he could *

In other instances an unexpected extension of the growth into some important structure is disclosed only at operation, and in such cases the surgeon himself must take the responsibility either proceeding as he thinks best, sacrificing the part without specific permission from the patient, or backing out if in his judgment the responsibility is too great.

The "Noli me Tangere in Head and Neck Surgery While in the treatment of head and neck tumors there is probably a greater chance of error by omission rather than by commission, there remain nevertheless occasional cases in which aggressive treatment of any kind—either by surgery or by radiation therapy—is not only useless but actually harmful and unjustifiably dangerous to life. In such cases the professed indications for operation might be compared to the classic reason of the mountaineer for climbing a mountain—"Because it is there" In brief, there are tumors both malignant and benign, which the judicious surgeon will conclude to be "touch me-nots. The decision to withhold

* A somewhat similar philosophy is expressed in the old epigram The pessimist says, My cup is half empty" the optimist says, "My cup is half full"

treatment of any kind in these cases (except as a *frank* placebo) or to back out of an operation already started rather than to proceed may call for great moral courage on the part of the surgeon

The most common contraindications to aggressive treatment are cases of hopelessly advanced tumors in which neither surgery nor radiation therapy can offer any chance of appreciable benefit to the patient In these a few light doses of x ray therapy purposely below the point of producing any physiologic change may often be justified for psychologic reasons

Two specific examples of lesions too often operated upon are carotid body tumors and *slow or stationary relatively benign growths* such as schwannomas presenting in the tonsillar area Typically in both these neoplasms there is an intimate association with the internal carotid artery which may be felt to pulsate superficially in the neck in carotid body tumors and on the mesial surface of the tumor within the pharynx in schwannomas located at this level When there is any risk of excision of the internal carotid artery in a case of a benign tumor the surgeon may well weigh the long term prognosis of the growth against the possibly serious immediate consequences of the operation Morfit and others have published series of cases of operative removals of carotid body tumors without a mortality including some in which the internal carotid artery was sacrificed or in which repair *was made of inadvertent lacerations of the ar*terial wall Such reports cannot be considered typical of carotid body tumors as a whole The *more deeply placed or larger tumors are often* not encapsulated in which event there is no possibility of complete removal, and in the long run unnecessary operative fatalities are bound to result.* Since the carotid body tumor itself is rarely malignant, little benefit is conferred on the patient by removing it, except to establish the diagnosis Carotid body tumors seldom terminate fatally except as the result of attempted operative removal necessitating ligation of the internal carotid

Usually a diagnosis can be made before operation either clinically or by aspiration biopsy In others the morbid anatomy is so typical once the tumor is exposed that the diagnosis can be made grossly and confirmed by frozen section. Having established the diagnosis, the *judicious* surgeon will choose to back out rather than to risk an unjustified operative mortality As has *been mentioned before it takes great courage to* back out in such cases—in fact, more courage than it does to proceed Although I have suc*cessfully* removed several carotid body tumors I deeply regret not having backed out in some others

According to Harrington Claggett and Dockerty about 50 per cent of carotid body tumors are malignant *histologically*—a statement which is often used as an argument for their routine surgical removal A more thoughtful consideration would raise the question as to whether these "histologically malignant" growths are actually clinically malignant." The fact remains that people rarely die of carotid body tumors except as the result of ligation of a common or internal carotid artery during an attempt to remove them

Age in Relation to Operative Mortality In former years one of the most commonly cited rea*sons for "inoperability"* was the age and general condition of the patient, with the clear implication that a poor general condition is an inevitable *corollary of old age Formerly* such a designation was acceptable as a contraindication to any surgical attempt to cure or to prolong life in *serious diseases such as cancer Such a* disposition was commonly referred to complacently as "giving the old man a chance" or "leaving the *old lady to die in peace"—a behavior pattern*

* Dr Leland Cowan of Salt Lake City in a recent personal communication has related to me that by odd coincidence about eight years ago *he admitted to his Service and operated upon* (within a period of a few weeks) three new patients who proved to have carotid body tumors. In all three, the tumors were found to be so deeply attached as to be nonresectable except by ligating and resecting the internal carotid artery After making a biopsy he backed out without resection in all three cases, and has followed the patients ever since. All three are alive and without subjective symptoms. He further commented that had he taken *the internal carotid* in all, the chances are that at least one would have succumbed to the operation.

I have had under my personal observation for over five years two patients with carotid body tumors in whom, *although the growths are fairly bulky there are no subjective symptoms*. In both cases the carotid artery is palpable just beneath the skin. After frank discussion with both patients, I have advised observation only Both are following their usual occupations without any disability or discomfort other than the visible swelling in the neck.

little different basically from that of many primitive societies in which the old person, no longer fit to make war fish, hunt, or keep up with the tribe on the march, was left behind or abandoned outside the camp with what was considered a reasonable supply of food and water When an overcautious internist rules that an old cancer patient's general condition renders him "inoperable" he usually leaves no alternative to complete inaction except for "palliative" radiation therapy which in most cases serves mainly as a placebo and as a palliative to the doctor's conscience and convenience

A high mortality from pulmonary complications in the older age group was a strong deterrent to surgery prior to about 1940 The development of chemotherapy (sulfa drugs and then antibiotics) and early ambulation has at the present time largely eliminated most forms of pneumonia, which Osler termed the "friend of the aged" Recent statistical studies at Memorial Hospital have shown there are no appreciable variations in postoperative mortality following head and neck surgery between the ages of 40 and 60 Postoperative deaths in this group numbered about 0 6 per cent in all operations requiring general anesthesia Above the age of 60 the mortality was 1.3 per cent, but whereas from a superficial interpretation of these data it might be concluded that the operative risk in patients over 60 is twice that in patients under 60 nevertheless the difference between 0 6 per cent and 1 3 per cent is only 0 7 per cent. In other words the chance of operative mortality in cancer surgery of the head and neck in patients over 60 years of age is actually only a little over 1 in 100

At the present time on the Head and Neck Service at Memorial Hospital no person is denied radical surgery because of old age alone and the management of these older patients as regards such factors as early ambulation is the same as for younger patients although possibly a little more attention is given the detection and treatment of minor degrees of such abnormalities as hypertension, albuminuria, or glycosuria.

BIOPSY

It is axiomatic that aggressive treatment for cancer whether by surgery or radiation therapy, is seldom justified in the absence of histologic proof of the diagnosis if the lesion is accessible to biopsy * In some deeply situated growths confirmation of the diagnosis by biopsy before treatment may be impossible and it may be necessary to proceed on clinical and radiographic evidence alone The rule applies mainly to the establishment of the initial diagnosis of cancer and not necessarily to all subsequent recurrences or metastases Should the surgeon feel inclined to make exception to this rule he must, of course accept full responsibility

Punch Biopsy The hazards of dissemination of cancer by making a biopsy from superficially ulcerated growths has undoubtedly been over emphasized Although most superficial biopsies are made with some form of biting forceps, the punch illustrated in Fig. 12 will be found useful in lessening the trauma (laceration) to the tumor and the crushing of the tissue fragment. After sinking the punch into the tissue with a rotary motion, the "core" is removed with a biting forceps or scalpel (Figs 13–21) The punch can also be employed through a laryngoscope to partially mobilize a specimen from the larynx preparatory to biting the tissue fragment off with a regular specimen forceps (Figs 22–24)

The Problem of the "Lump in the Neck." The question of immediate biopsy of a cervical mass often arises when a patient seeks medical advice concerning a "lump in the neck" Too often the examining doctor unthinkingly decides that the first step in diagnosis should be local excision (sometimes even a partial removal) of the mass in question

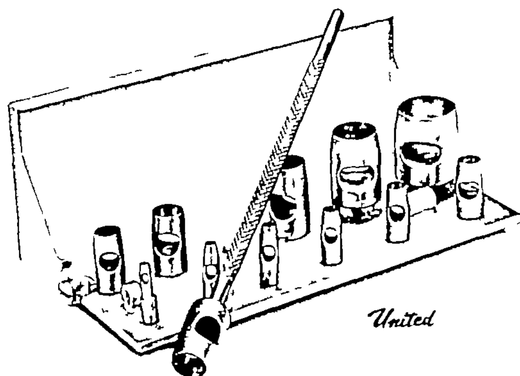
A safe general rule is that *asymmetric enlargement of cervical lymph nodes in the adult is almost always cancerous usually from a primary lesion in the mouth or pharynx* It is assumed, of course that the examining physician can differentiate enlarged lymph nodes from such obvious benign lesions as lipoma, and cysts (thyroglossal or branchiogenic) of long

* Lacking histological confirmation (when preoperative biopsy could have been made by one of the conventional methods, including aspiration biopsy or frozen section) the surgeon must make a decision by guessing as to the character and extent of his operation for suspected cancer The fact that the guess of an experienced surgeon is frequently right in such cases *does not prove nevertheless, that he was right in guessing* for should such an unnecessary guess be wrong, the surgeon would be guilty of gross negligence.

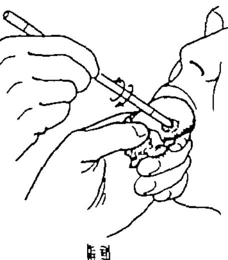
PUNCH BIOPSY

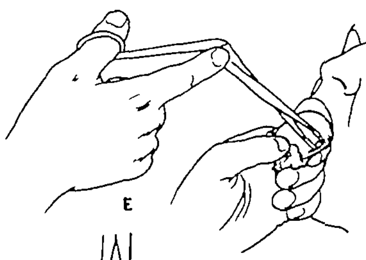
By rotating back and forth the punch (*A* and is sunk into the tumor (*C*) to detach the specion all its aspects except the base (*D*)

The partly detached tissue specimen is grasped biting forceps (*E F*) and completely detached



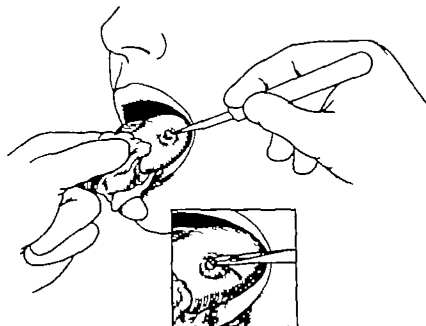
12 Biopsy punches. A graduated set of punches 2–12 mm. with an attachable handle is useful for mobilizing biopsy specimens and for punching out small superficial skin lesions, as well as for outlining small full-thickness skin grafts.



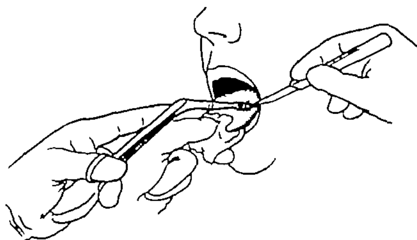


BIOPSY BY SCALPEL AND BITING FORCEPS

15 and 16 After infiltration anesthesia the tissue specimen to be removed is partly mobilized by a scalpel and then the removal completed either by continuing with the scalpel or by the use of a biting forceps

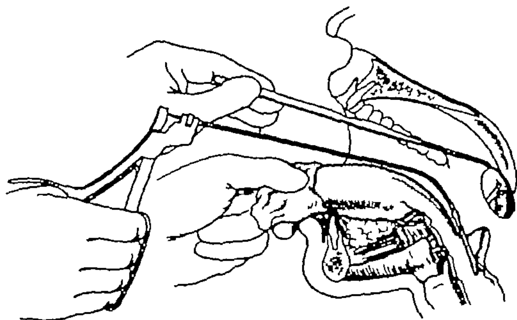


15 Biopsy by scalpel and biting forceps.



16 Biopsy by scalpel and biting forceps.

BIOPSY FROM THE LARYNX OR HYPOPHARYNX BY INDIRECT MIRROR LARYNGOSCOPY



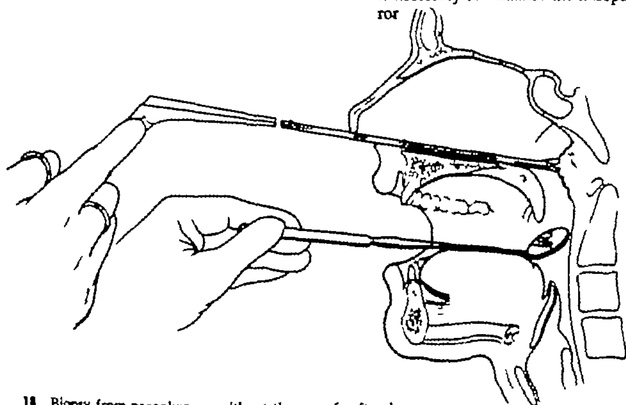
17 With an assistant to pull out and hold the tongue a biopsy specimen from the hypopharynx is sometimes more expeditiously removed by a curved specimen forceps guided by a mirror view

BIOPSY FROM THE NASOPHARYNX

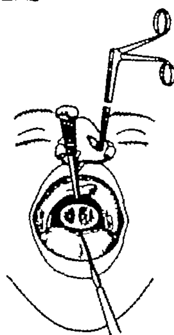
There are several methods of removing a tissue specimen from the nasopharynx, guided either by mirror examination or by the palpating finger

18 In certain cases the patient may be able to relax the soft palate so that the nasopharynx may be visualized and the biopsy instrument inserted through the nasal cavity guided visually to remove the specimen

19 In most cases however, a soft palate retractor is necessary to visualize the nasopharynx with a mirror

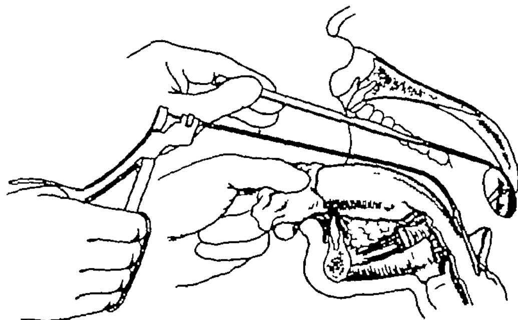


18 Biopsy from nasopharnyx without the use of soft palate retractor



19 Biopsy from the nasopharynx using a soft pal

BIOPSY FROM THE LARYNX OR HYPOPHARYNX BY INDIRECT MIRROR LARYNGOSCOPY



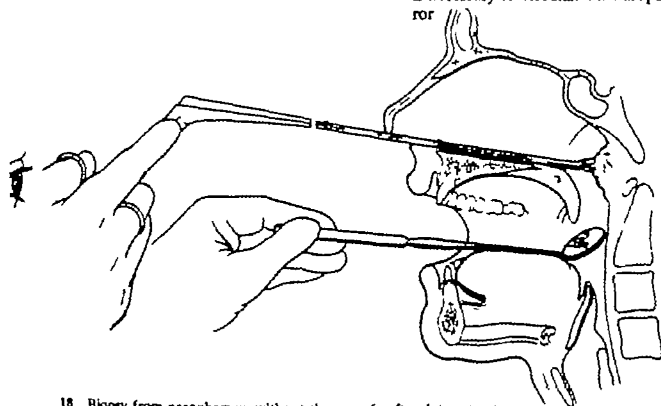
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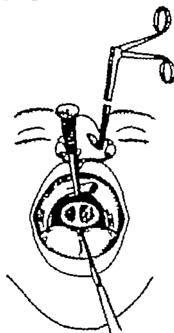
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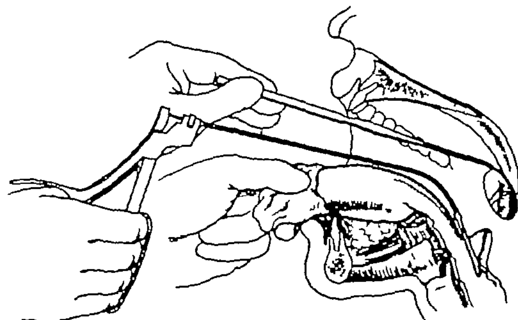


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BIOPSY FROM THE LARYNX OR HYPOPHARYNX BY INDIRECT MIRROR LARYNGOSCOPY



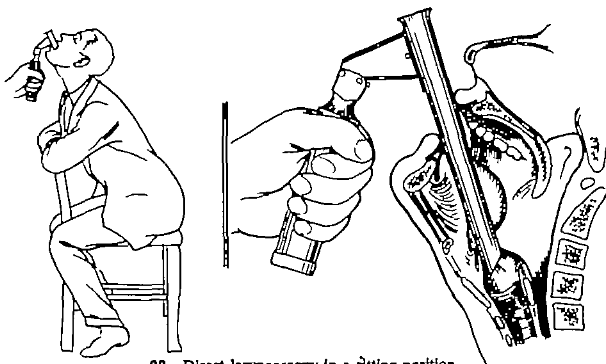
17 With an assistant to pull out and hold the tongue a biopsy specimen from the hypopharynx is sometimes more expeditiously removed by a curved specimen forceps guided by a mirror view

DIRECT LARYNGOSCOPY FOR BIOPSY OF THE LARYNX AND HYPOPHARYNX OR FOR BIOPSY OR FOR STRIPPING OF THE CORDS

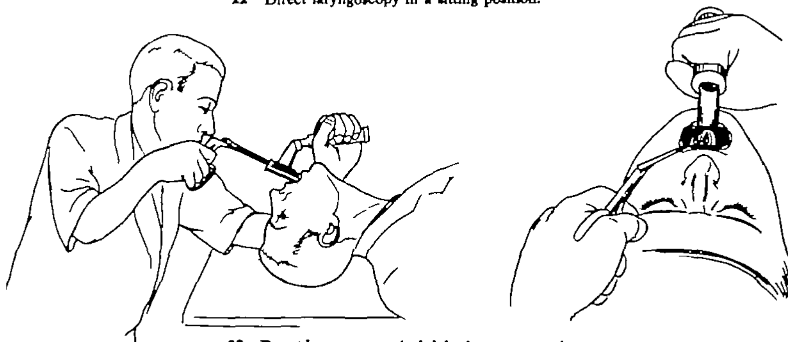
Direct laryngoscopy can be made with the patient either in the sitting position, straddling a chair or prone on the table

22 The patient is seated straddling a chair with his arms folded over the back and is directed to thrust his chin forward as far as possible and to relax, so that the instrument may be inserted over the base of the tongue to approach the larynx

23 With the patient in the prone position, direct laryngoscopy can be accomplished in a cooperative patient without the aid of an assistant



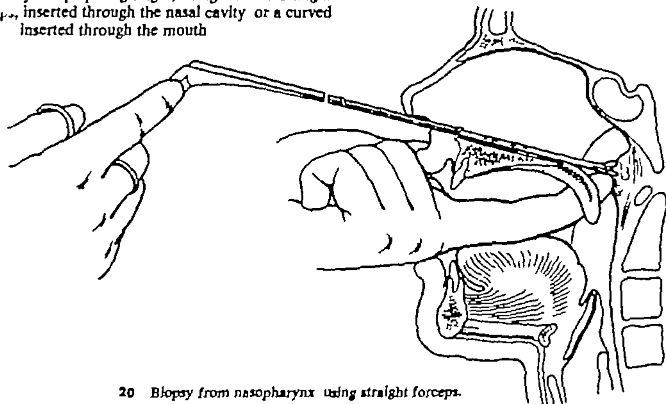
22 Direct laryngoscopy in a sitting position.



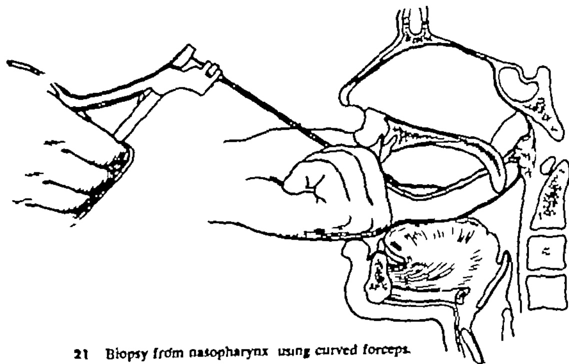
23 Direct laryngoscopy (solo) in the prone position

BIOPSY OF NASOPHARYNX CONTINUED

and 21 Biopsy from the nasopharynx may be ..d by the palpating finger, using either a straight .., inserted through the nasal cavity or a curved inserted through the mouth



20 *Biopsy from nasopharynx using straight forceps.*



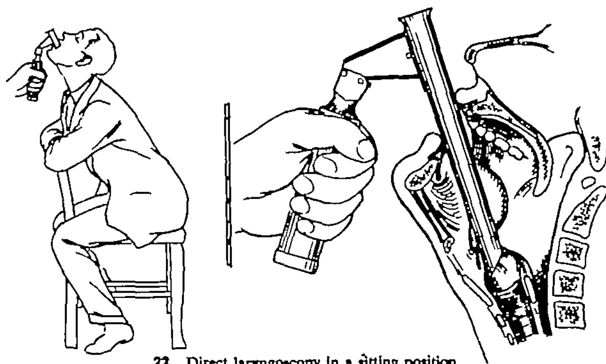
21 *Biopsy from nasopharynx using curved forceps.*

DIRECT LARYNGOSCOPY FOR BIOPSY OF THE LARYNX AND HYPOPHARYNX OR FOR BIOPSY OR FOR 'STRIPPING OF THE CORDS

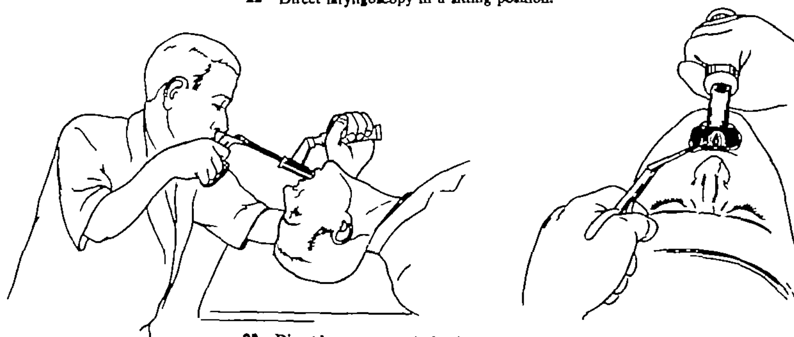
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22 Direct laryngoscopy in a sitting position.

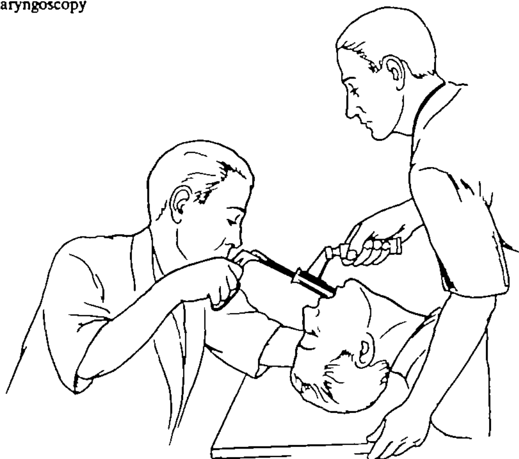


23 Direct laryngoscopy (solo) in the prone position.

DIRECT LARYNGOSCOPY CONTINUED

The patient is prepared by a hypodermic injection morphine and scopolamine (or their equivalent) ad topical anesthesia by a solution of cocaine or yclaine

4 Except in the most cooperative patients, direct ryngoscopy under either local or general anesthesia best carried out with the help of an assistant, who serts the laryngoscope and partly raises the head nd neck from the table accomplishing, in effect, a ispension laryngoscopy



24 Direct laryngoscopy in a prone position with the help of an assistant.

duration If the physician is aware of and accepts the foregoing rule, he will prudently defer biopsy while making a thorough search for a suspected primary lesion Failing to find it at first, he might well consider whether aspiration biopsy might provide useful and possibly adequate diagnostic information A diagnosis of metastatic cancer without discovery of the primary growth can be of little value from the standpoint of treatment since there can be no cure of cancer without specific location and treatment of the primary lesion The excision of a cervical node for diagnosis in cancer seriouly interferes with the subsequent treatment of adjacent metastatic foci, either by surgery or by irradiation In brief *a cervical lymph node (or mass) should never be excised for biopsy except as a last resort and then only after failure of a thorough and repeated search for a primary lesion and an aspiration biopsy*

Aspiration Biopsy Aspiration biopsy does not change the physical characteristics of a cancerous node or primary lesion sufficiently to interfere with subsequent treatment This measure should be applied in all cases of cervical tumors in which the primary lesion of cancer has not been discovered promptly in the mouth or pharynx Aspiration biopsy can also be used in other areas of the head and neck such as subcutaneous masses or deep lying nonulcerated masses in the antrum base of the tongue and orbit.

The technic of aspiration biopsy is not difficult, but the procedure requires sympathetic cooperation between clinician and pathologist The material obtained may either be smeared with slight crushing on a slide and stained or the fragment of tissue (often mixed with aspirated blood) expressed on a small piece of blotting paper allowed to clot and then prepared by fixation and paraffin section as a routine small tissue specimen Little can be expected from a biopsy smear except such diagnosis as "malignant tumor" or "malignant epithelial tumor" although in some cases the pathologist may be able to make such further suggestions as squamous carcinoma" or "probably adenocarcinoma" when he associates the appearance of the stained smear with a knowledge of the source of the material

When tissue from an aspiration biopsy is prepared by paraffin section, it is similar to any small tissue fragment taken by conventional biopsy methods Although the area of the preparation may be small, the total may be that of many microscopic fields which on the whole are just as adequate for diagnosis as a large or conventional biopsy

The procedure has limitations similar in many respects to those of other forms of biopsy For instance, the point of the needle must enter the ~~cancerous or representative portion of the node~~ (or tumor) otherwise the report will be a false negative. The same can be true of an incisional or surface biopsy taken by scalpel or biting forceps It is admittedly more difficult to obtain tissue by needle aspiration than by biting or cutting it off On the other hand cancerous tissue is less organized than normal tissue and enters the bore of the needle much more easily Failure to obtain tissue is often due to lack of skill and experience on the part of the operator and a second attempt will sometimes succeed. Experience is also required on the part of the pathologist who at first may hesitate to make histologic diagnosis except on larger (paraffin) sections A sympathetic understanding between the clinician and the pathologist as to the possibilities as well as the limitations of the test and its chances of helping the patient will tend to promote success and confident acceptance of the procedure

Critics of aspiration biopsy often point to the theoretical danger of puncturing a cancerous mass and thereby disseminating tumor cells into the lymphatics Others have theorized that cancer may be disseminated by being spilled out of the needle during withdrawal At Memorial Hospital although it is conceded that such risks are theoretically possible it is felt that the same objections hold true theoretically" in any and all manipulations of a tumor mass during physical examination and especially during incisional biopsy or any other form of open surgery In brief *there is no way to make cancer a safe disease* simply by avoiding any manipulation whatever and letting the tumor pursue its uninterrupted course Furthermore aspiration biopsy in selected cases will undoubtedly enhance the over all possibility of cure by promoting an earlier diagnosis and treatment

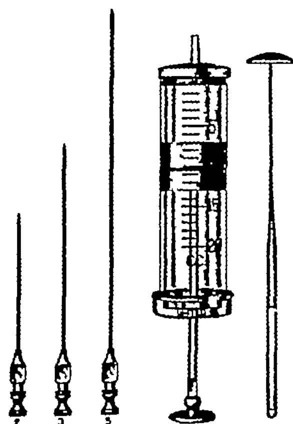
Technic of Aspiration Biopsy The special instruments required (Fig 25) are three 18-gauge needles 5–10 cm in length and a 20 cc. tightly fitting record syringe Needles of about 15 to 20 cm in length are sometimes required for

ASPIRATION BIOPSY

5 A glass syringe (Record type) is supplied with hree 18-gauge needles with obturators 2 3 and 5 nches in length A rake" is used to pull out tissue ragments and blood which may enter the syringe

6 An 18-gauge needle attached to a Record syringe s inserted through the skin guided by the palpating iand until the point of the needle is felt to enter the umor

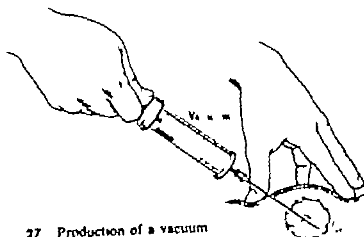
7 With the needle stationary, a vacuum is proluced in the syringe by partly withdrawing the piston



25 Aspiration biopsy set.



6 Insertion of the needle



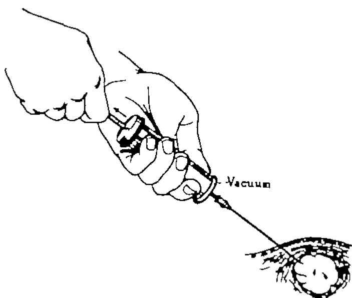
27 Production of a vacuum

ASPIRATION BIOPSY CONTINUED

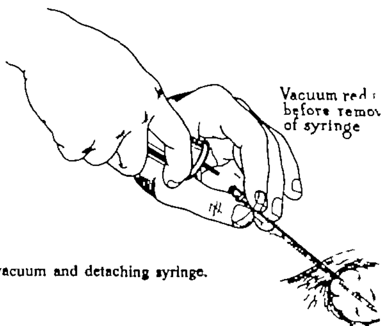
28 Maintaining the vacuum the needle is then advanced a distance of 1 to 3 cm depending upon the size of the tumor Maintaining the vacuum the needle is then withdrawn to the starting point This manipulation may be repeated once or twice with a slight change in the direction of the needle

29 The vacuum in the syringe is gradually released and the syringe is detached from the needle before withdrawal

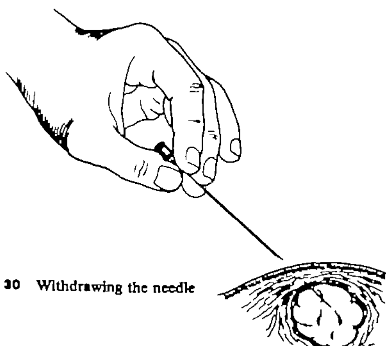
30 The needle which supposedly contains a plug of tissue from the tumor is then withdrawn separately



28 Puncturing and suctioning tumor tissue into the needle



29 Releasing vacuum and detaching syringe.

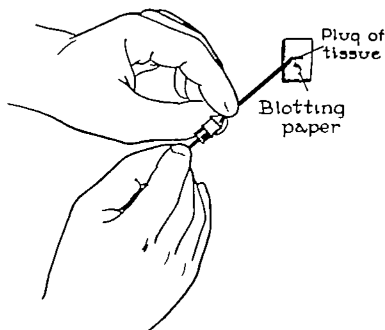


30 Withdrawing the needle

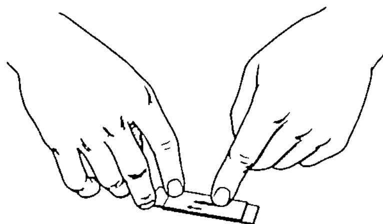
ASPIRATION BIOPSY CONTINUED

31 If the aspiration needle is equipped with an obturator the contents can be best expelled onto a piece of blotting paper for paraffin section or onto a glass slide for smear

32 A portion of the tissue fragment may be smeared by firm, flat pressure with another slide drawn once across for immediate staining. A portion of the plug may be placed in alcohol for fixation and section by the usual method.



31 Expelling the tissue plug.



32 Making a smear

aspiration at greater than average depths as for instance in the lung or prostate. Glass slides are necessary for smearing the specimens. A specimen bottle with 10% Formalin and a few 1 cm squares of blotting paper are required if a portion of the tissue is to be treated as a regular biopsy

The skin at the site of the intended puncture is disinfected and a small area of skin infiltrated with 1% Novocaine In particularly sensitive regions some of the local anesthetic is injected continuously along the line of the intended puncture down to the tumor With a bistoury-pointed scalpel (#11 Bard Parker blade) a stab wound is made through the skin This puncture of the skin facilitates insertion of the needle and prevents contamination of the aspirated material by surface epithelium The needle attached to the syringe with the piston closed (or the needle alone with an obturator) is then inserted and advanced slowly through the superficial tissues until the point is felt to enter the suspected neoplastic mass (Fig. 26) Guided by palpation with the free hand it is striking how readily a difference in consistency of the tissues can be felt as the point of the needle enters a mass of neoplasm The piston of the syringe is then partly withdrawn so as to produce a vacuum (Fig. 27) and the needle advanced 1 to 3 cm depending on the anatomy and size of the tumor The needle is then withdrawn the same distance advanced again and withdrawn, maintaining the vacuum constantly and keeping the point of the needle within the tumor (Fig. 28) Tissue from the tumor mass enters the needle and is held within it both by a punch action of the advancing needle and by the vacuum Care must be taken that the vacuum is maintained while the needle is manipulated within the tumor *Aspiration by suction alone with the needle at rest is not sufficient to draw tissue into the needle in most cases and is the most common cause of failure to secure tissue*

Before the needle is completely withdrawn from the tissues the piston should be released slowly and the syringe detached The needle is withdrawn separately (Figs 29 30) otherwise any remaining vacuum may cause the aspirated material to be suddenly drawn into and splashed over the interior of the syringe making its collection more difficult If the tumor is fairly firm in consistency blood or tissue usually do not appear in the syringe but the needle will be found to contain material. In soft and vascular tumors a small quantity mixed with fragments of tissue or a solid cylindrical mass of tissue may enter the syringe while the needle is being advanced and withdrawn.

After complete withdrawal of the needle the wire obturator is reinserted and the contents of the needle pushed out onto a glass slide if the preparation is to be a smear or onto a small piece of blotting paper (Figs 31 32) and then into Formalin if the specimen is to be processed by paraffin section If the needle is found to be empty blood or any other material in the syringe should be carefully scrutinized for tissue fragments, by rolling the syringe between the eyes and a source of light so that any fragment of tissue can be fished or raked out, onto either a glass slide or blotting paper as above mentioned If there is as much as 1 or 2 cc the whole mass of the clot, possibly containing tissue fragments should be raked out into a bottle of Formalin for processing by paraffin section

Frozen Section Although a histologic slide of a frozen tissue specimen usually compares unfavorably with a paraffin section from a well fixed preparation nevertheless frozen section is the only means of obtaining an immediate microscopic diagnosis to assist the surgeon in determining the necessary extent of the resection—a question which is seldom vital except in surgery for cancer

In head and neck cancer frozen section is particularly useful in the diagnosis of thyroid tumors, where the preoperative differentiation between cancer and benign adenoma is not possible in most cases Other indications for frozen section will occur in some cases of cancer of the mouth pharynx, and larynx, where the excision of a few millimeters more of a doubtful margin may spell the difference between success and failure

In some surgical clinics frozen section is considered unreliable that is neither the pathologist nor the surgeons have any great faith in it Like any other laboratory test, frozen-section examination sometimes fails (more frequently by giving a false negative rather than a false positive)—a fault that epitomizes the danger of placing too great a faith in any laboratory test in medicine As in any other test, its usefulness as well as accuracy increases with the experience

of the pathologist and the sympathetic understanding of the surgeon. If frozen section is seldom used the pathologist will obviously lack efficiency and confidence in the procedure

The fact that physical facilities are not available is often advanced as an excuse for omission of this test when otherwise indicated It is probable that if a surgical staff insists upon having a frozen section as a surgical aid, physical facilities will be provided promptly for its development, and the pathologist will be stimulated to perfect his skill and to gain confidence Other institutions have probably had the same experience as Memorial Hospital that frozen section at one time viewed with considerable distrust by both pathologists and surgeons has by repetition and practice gradually become more and more acceptable and trustworthy As a matter of fact, this test—associated of course, with gross examination of the surgical specimen—is the only way to establish the presence of previously undiagnosed cancer at any given site during operation.

About all that can be expected from the quick preparation of a frozen section is an opinion that a given tumor is benign or malignant. The exact histologic classification of the tumor in most cases must await study of a paraffin section of the surgical material When this is prepared from surgical material several days after operation, the die has already been cast and nothing further can be done for the patient for the time being.

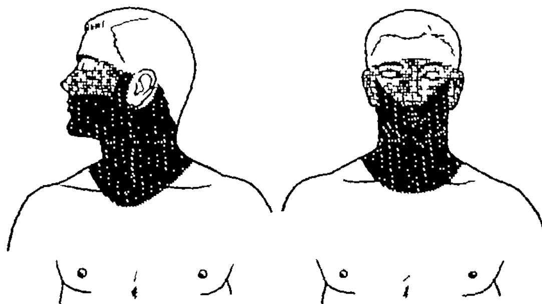
Chapter 3

THE OPERATION—TECHNICAL CONSIDERATIONS

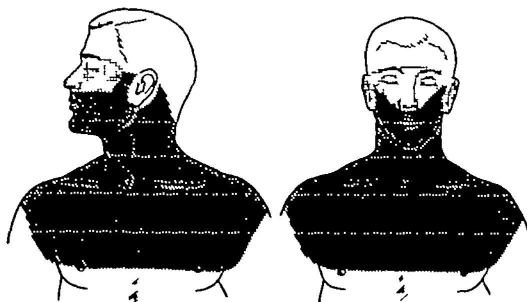
Although the recent developments in surgical aids obviously apply to all branches of the art, their specific application will depend on the problems peculiar to any one branch. These problems are highly individualized in surgery of the head and neck, and utilization of all modern knowledge has resulted in many new technics or modifications of old ones. In this chapter, I propose to discuss the general application of these principles, leaving the description of the actual operative technics to subsequent chapters.

SHAVING AND STERILE PREPARATION OF THE OPERATIVE FIELD

Directions as to the location and extent of the area of the head, neck and chest to be shaved must either be specifically given in each case or a routine established otherwise, the surgeon will often find at the time of operation that the area is incompletely prepared. Even the most experienced nurse is often uncertain as to the exact area to be shaved, and the problem is always confusing to the inexperienced nurse or attendant without specific instruction. Since most difficulties are due to inadequately wide preparation, the nursing staff would be well advised to shave a wide area should there be any doubt.



33 Preparation suitable for minor operations on the face, lip, or within the mouth, not involving the neck. The heavily hatched areas are shaved and the lightly hatched areas are included in the painting.



34 Preparation for most head and neck operations (excluding the scalp) The heavily hatched areas include the skin of the face and part of the scalp just back of the ear The whole neck and anterior chest down to the nipple is shaved in males. In females some hair must be clipped and shaved just back of the ear

The whole outlined area, including that lightly hatched is painted with a skin disinfectant.

Specific instructions should also be given as to area to be painted with a skin disinfectant, and it is always better to paint too much than too little

In operations limited to the face, the conventional shave is sufficient but sterile preparation should include the nose ears and eyelids If the patient is told to keep the eyes closed during the painting until the excess has been removed with a dry sponge there is no risk in the use of a weak solution of iodine or Zephiran over the closed palpebral margins.

For more extensive operations on the mouth parotid area and neck the shaving and skin preparation should be wider Some hair should be shaved in the mastoid area and *in males the shaving should extend down to the nipple line* the painting with disinfectant covers a similarly wide extent These considerations are graphically illustrated in Figs 33 34

ANESTHESIA

When the inhalants (ether chloroform nitrous oxide etc) and rectal instillation of various agents were the only available forms of general anesthesia the mechanical difficulties and the complications of their administration in head and neck surgery were so great that there was a natural tendency to favor infiltration or nerve block for many major operative procedures such as neck dissection total laryngectomy and partial glossectomy The development of intravenous sodium Pentothal and technics of tracheal intubation has practically eliminated these difficulties so that there is no longer any need for either the patient or the surgeon to struggle through the strain of several hours of surgery with local anesthesia Detailed descriptions of the technics of Pentothal anesthesia as used in the Head and Neck Service of Memorial Hospital have been published (Schweizer 1949) As is shown in Fig. 35 the same system of venipuncture and flexible tubing connected with a flask of saline is used for the Pentothal and for the blood transfusion, and a blood pressure cuff with the diaphragm of a stethoscope is attached to the opposite arm with the connecting tubes led across the patient s chest With this arrangement, the intravenous anesthesia the gas machine the blood pressure readings the saline infusion and the transfusion of blood may all be controlled from a single anesthetist s station

When intravenous Pentothal is administered

through a vein in the wrist or ankle and an endotracheal breathing tube (#29–35 French) is connected to the gas machine the anesthesia apparatus is kept at a convenient distance from the operative field, so that the anesthetist, as well as the surgeon and his assistants may work unhampered by crowding. The induction is rapid and relatively easy for the patient, and the recovery from the anesthetic is usually prompt, with a negligible incidence of pulmonary complications Nausea and vomiting, which so frequently follow inhalant anesthetics such as ether, are avoided

While the aforementioned set-up with the anesthetist at a convenient distance is essential for the work both of the surgeon and the anesthetist, it is, nevertheless somewhat different from the anesthetic set up for surgery in most other parts of the body In the head and neck set up the anesthetist must do without observation of the degree of facial cyanosis the eye reflexes as well as the depth of respiration except by observation of the breathing bag. Actually however when situated unencumbered at a distance of three to four feet from the operative site, with such ready facilities as blood pressure apparatus, the radial pulse at the wrist, the breathing bag to gauge the depth and adequacy of respiration and the surgeon s observation of the color of the blood in the operative wound the anesthetist is probably in better control of the situation than when in more immediate contact with the patient s face and head

Preanesthetic medication for surgical operations about the head and neck is given by hypodermic one to one and a half hours prior to operation This provides sedation and overcomes apprehension while at the same time it lowers the necessary dose of thiobarbiturates (Pentothal or Surital) Demerol (100–150 mg.) combined with scopolamine (0 4 mg) is a practical dose for the average adult, supplemented, if necessary by additional doses of Demerol (10–25 mg) if the patient arrives in the operating theatre with an apparently insufficient dose

In addition to the above mentioned sedation, topical anesthesia (cocaine 10% or Cyclaine 5%) should be sprayed into the hypopharynx and larynx after exposing the parts by laryngoscope This topical anesthesia is even more efficient when about 2 cc is administered through a translaryngeal approach by way of the cricothyroid membrane, using a #22 needle 2" long. By this means the topical anesthetic is distributed throughout the region of the glottis reducing the stimulation of the laryngeal spasm and cough reflex, which may be retained even under fairly deep thiobarbiturate anesthesia With such preparation the average dose of Pentothal or Surital is 1.5–2 gm

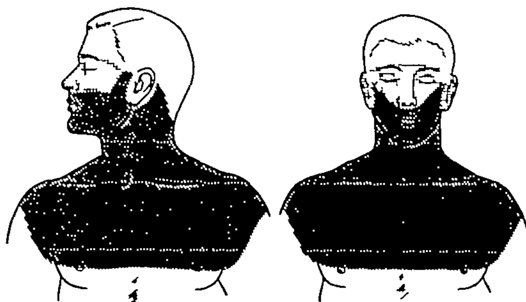
Nerve Block or Regional Anesthesia Before the development of intravenous thiobarbiturates, nerve block anesthesia was of comparatively greater importance than at present. In head and neck surgery it was commonly used either alone or as a supplement to local infiltration in order to avoid the mechanical disadvantages and hazards of inhalation anesthesia A consistently effective technic of nerve blocking was somewhat difficult to achieve requiring long practice, and even then it often failed (especially in mandibular block) when it was most needed

The nerves most accessible to such blocking are the following the infraorbital the mandibular the inferior dental, the mental, the superior laryngeal and the nerves of the cervical plexus. Of these one of the most practical and satisfactory (if successful) was a double block of the mandibular nerves by the zygomatic route, producing anesthesia of the lower lip lower face, the lower gum floor of mouth and anterior two thirds of the tongue sufficient for fairly extensive operations in this area On the other hand if it failed the patient underwent a great deal of needless pain before local infiltration or general anesthesia was achieved Under such conditions both the patient and surgeon were under a great deal of nervous strain

In contrast to the mandibular nerve, the infraorbital foramen and nerve are not difficult to locate with the point of the exploring needle and bilateral infraorbital block is therefore the method of choice even today for limited operations of the lower two thirds of the nose lower eyelids and upper lip

The mental foramen is somewhat more difficult to locate but the attempt should always be made and 3–4 cc of anesthetic solution injected in the general neighborhood in operations on the lower lip under local anesthesia

Blocking of the superior laryngeal nerve—a somewhat inexact maneuver—was at least of some assistance in total laryngectomy under



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local anesthesia and the same was true of cervical plexus block in neck dissection neither however was sufficient alone Since the development of present-day refinements in the technic of intravenous anesthesia most of the foregoing indications of block anesthesia have been eliminated.

Hypotensive Anesthesia Despite the fact that *one of the earliest uses for hypotensive anesthesia* (hexamethonium bromide Arfonad etc) was for plastic surgery of the face this theoretically valuable aid has proved so disappointing and dangerous for radical surgery in this area that we have given it up entirely Lowering the systemic blood pressure undoubtedly lessens the blood loss in any form of surgery but hypotension in the head and neck necessarily implies a lowering of the cerebral blood pressure, and this occurred in several of our cases to such a degree as to result in permanent damage (in one case fatal) to the higher functions of the brain The practice of lowering blood pressure in a specific region of the body such as the pelvis, combined with raising it above the level of the head, will decrease the blood flowing through the area and at the same time actually increase the volume of blood in the head. To decrease the local circulation in the head and neck in hypotensive anesthesia would necessitate raising the head thereby tending to bring on uncontrollable and dangerous lowering of the cerebral circulation

Although a moderate elevation of the head and shoulders above the rest of the body (without the administration of any hypotensive drug) is of value I would repeat my recommendation that hypotensive drugs be considered as unsafe in radical surgery of the head and neck

FREE AIRWAY FOR DURATION OF ANESTHESIA AND MEASURES TO PREVENT ASPIRATION OF BLOOD

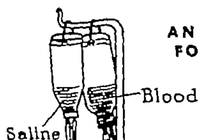
Two of the most significant of the former hazards of surgery of the mouth and pharynx were the difficulty of maintaining a free airway during anesthesia and the danger of aspiration of blood into the trachea and lungs during the more hemorrhagic phases of the operation Although recent developments have largely eliminated these risks, obstruction of the airway and a filling of the mouth and pharynx with blood *can still occur* Since the open airway and the prevention of aspiration of blood are so closely associated physiologically and mechanically the two hazards—and the means to circumvent them—are best discussed together

The freedom of the airway may be obstructed in several ways by the tongue falling back into the pharynx by the presence of packing within the mouth or pharynx and by spasm of the glottis In addition any blood that accumulates in the pharynx during the operation will inevitably be aspirated into the bronchial tree unless prevented There are several expedients by which these complications can be prevented Each serves a specific purpose depending upon the exact operative site and the associated manipulations

Endotracheal Tube with Packing in Pharynx (Figs 36 37) A soft rubber tube (±29–35 French) is inserted through the nasal cavity (less often through the mouth itself) and guided by direct observation through a laryngoscope, passed down into the trachea between the cords. The outer end of the tube as it emerges from the anterior naris is taped to the skin and connected with the anesthesia machine (see Fig. 35) If the operative procedure is to be within the mouth (or maxilla) the pharynx is then packed about the tube with plain gauze packing (two or more 4 x 8 in sponges) care being taken not to traumatize the soft palate during insertion If this packing is firmly pushed into place there should be little or no exchange of breathed air except through the tube itself and no aspiration of any blood accumulating in the pharynx

Endotracheal Tube with Inflatable Cuff (Fig 38) This device is an alternative to the simple tube and packing just described A cuff is placed over the lower end of the tube and the balloon inflated to block off the trachea below the glottis A moderate disadvantage to this device is that with the balloon attached the tube cannot be passed through the nasal cavity and it is useful therefore only when for other reasons the tube must be passed through the mouth

Simple Tracheostomy with Packing in Pharynx. A simple expedient not requiring the special apparatus is the performance of a tracheostomy followed by firm packing of the hypopharynx with one or two fluffed-out 4 x 8 in sponges The main disadvantages to this method are that the packing does not provide an absolutely

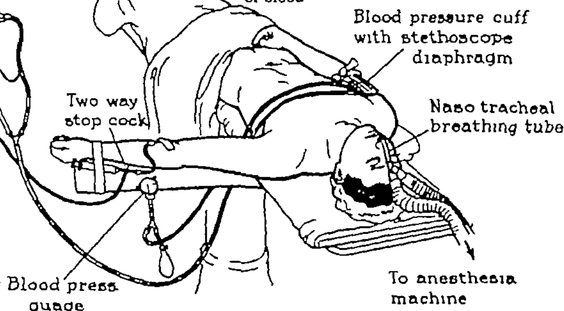


ANESTHESIA SET-UP AND VARIOUS DEVICES FOR MAINTAINING AN ADEQUATE AIRWAY

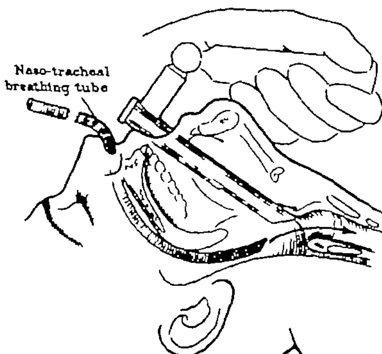
35 The anesthesia set up for intravenous anesthesia and blood transfusion in head and neck surgery

36 The most certain method of insertion of a naso-tracheal catheter is by visualizing the glottis with a laryngoscope

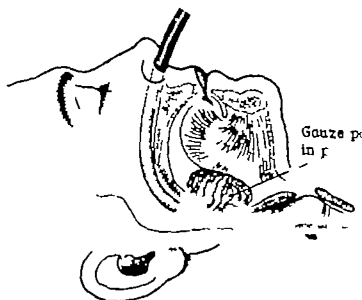
37 The distal end of the tube may be passed 3 or 4 cm below the level of the glottis Gauze (one or two 4 x 8 in sponges) is packed into the hypopharynx to seal off the larynx and trachea to prevent seepage of blood



35 The set-up for anesthesia and transfusion.



36 Direct laryngoscopic control during tracheal intubation.

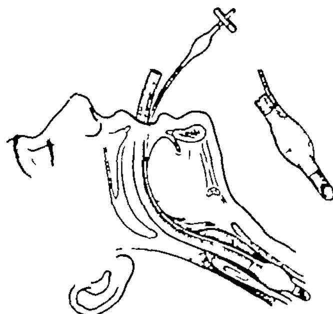


37 Nasotracheal breathing tube in place pharyngeal pack.

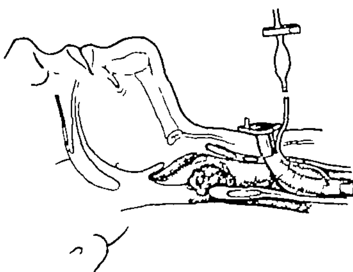
ANESTHESIA SET-UP AND VARIOUS DEVICES FOR MAINTAINING AN ADEQUATE AIRWAY CONTINUED

An inflatable balloon cuff effectively seals off airway from seepage of blood into the trachea. dinarily because of its bulk such a tube is difficult impossible to insert through the nasal cavity This vice is particularly applicable in operations on the axilla or nasal cavities, when for specific reasons the eathing tube must be inserted through the mouth

After the tracheostomy tube with the cuff at hed is inserted the balloon is inflated to seal off the icheal airway from the larynx and hypopharynx.



38 Endotracheal breathing tube with inflatable balloon cuff



39 Tracheostomy tube with inflatable cuff

BREATHING TUBE FOR TOTAL LARYNGECTOMY

0 *When the trachea has been severed during total* ryngectomy the danger of aspiration of blood and f an obstructed airway is overcome by the use of a becial right-angled balloon cuff breathing tube hich *effectively seals off the trachea from the oper* tive wound



continent barrier against seepage of blood down into the glottis, and that the surgical manipulations in the pharynx tend to dislodge the packing so that it must be frequently replaced

When a preliminary tracheostomy is to be performed before an operation in which Pentothal anesthesia is to be used it might seem reasonable to the inexperienced anesthetist and surgeon to put the patient to sleep before making the tracheostomy Although the attempt may often be successful and without incident, actually it is risky Complete anesthesia with Pentothal leaves the laryngeal reflex active and the manipulations during tracheostomy may induce complete spasmodic closure at the glottis and suffocation before the trachea can be opened. The risk is particularly great in cases where by reason of a bulky overlying growth tracheostomy is likely to be difficult It is therefore, always advisable to perform any preliminary tracheostomy under local anesthesia, or at least to expose the trachea before putting the patient to sleep

Tracheostomy Tube with Inflatable Cuff (Fig. 39) In certain cases there may be a lesion within the pharynx or larynx itself that would render it difficult or cumbersome to pass a breathing tube Since tracheostomy would be necessary in any case at the end of the operation, it may often be considered the better expedient to do a preliminary tracheostomy under local anesthesia and to insert the metal tube with an inflatable cuff on it, so that the trachea is completely blocked off from the glottis and the larynx. Indications for such a maneuver are found in some cases of cancer of the intrinsic larynx, bulky pharyngeal growths, and in cases of postradiation edema of the arytenoids and glottis.

Balloon Cuff Anesthesia Tube (Fig. 40) This device is of particular value in total laryngectomy or in a second operation, such as neck dissection, following a previous total laryngectomy The device consists of a right-angled latex rubber tube with imbedded stainless steel coiled wire to prevent collapse or buckling One end is bent at a right angle for insertion into the open trachea A replaceable balloon cuff which is secured by wrapping a few turns of silk at each end, is located on the short section of the tube The tube is inflated through a built in catheter of small caliber Eyelets are provided so that the short end may be sutured to the tracheal stump preventing displacement The tube is of sufficient caliber to allow adequate respiratory exchange

POSITION OF THE PATIENT ON THE OPERATING TABLE

The proper placement of the patient on the operating table is necessary to insure an adequate exposure of the operative area. A foot piece lift sheet, knee strap and armboard should be routinely used The field of operation should be made as prominent and accessible as possible There should be no pressure of the arms on the chest and no restriction of respiratory excursion by sheets or straps

The patient is usually in a dorsal recumbent position The head is on a somewhat higher level than the feet, thereby tending to lessen the blood pressure—particularly venous—in the head and neck, and so reduce blood loss in most operations in this area The bend of the neck should be over the hinge of the headpiece so that when the latter is raised or lowered the head may be either flexed or extended on the neck

A small pillow (3 x 4 thick) a rolled blanket, or sandbag should be placed under the shoulders so the head drops backward the chin remaining on a plane horizontal with the shoulders An exception to this rule occurs in procedures concerned with the skin of the face paranasal sinuses maxilla and orbit where the forehead and chin should remain on the same level The pillow or roll under the shoulders should be removed and the headpiece raised so as to flex the neck at the time of beginning the closure of such operative wounds as the pharyngeal opening following laryngectomy and the horizontal incisions in thyroid surgery (Fig. 579)

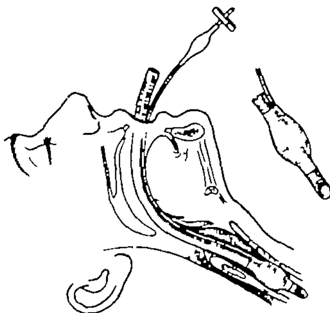
DRAPING OF THE PATIENT

The most important principle in draping the patient for operations about the head and neck is the placement of two superimposed and slightly overlapped half-sheets under the head and neck The bottom sheet is left to cover the head of the table and the top sheet is folded over the upper portion of the patient's face and scalp When the patient has long hair it is use

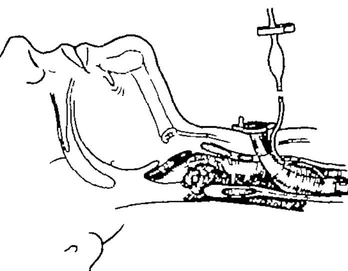
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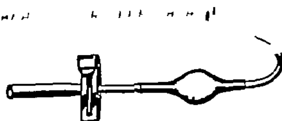
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When the trachea has been severed during total yngectomy the danger of aspiration of blood and an obstructed airway is overcome by the use of a right-angled balloon cuff breathing tube, effectively seals off the trachea from the oper wound



(Martin Flynn)

continent barrier against seepage of blood down into the glottis, and that the surgical manipulations in the pharynx tend to dislodge the packing so that it must be frequently replaced.

When a preliminary tracheostomy is to be performed before an operation in which Pentothal anesthesia is to be used it might seem reasonable to the inexperienced anesthetist and surgeon to put the patient to sleep before making the tracheostomy Although the attempt may often be successful and without incident, actually it is risky Complete anesthesia with Pentothal leaves the laryngeal reflex active, and the manipulations during tracheostomy may induce complete spasmodic closure at the glottis and suffocation before the trachea can be opened. The risk is particularly great in cases where by reason of a bulky overlying growth tracheostomy is likely to be difficult It is therefore, always advisable to perform any preliminary tracheostomy under local anesthesia, or at least to expose the trachea before putting the patient to sleep

Tracheostomy Tube with Inflatable Cuff (Fig 39) In certain cases there may be a lesion within the pharynx or larynx itself that would render it difficult or cumbersome to pass a breathing tube Since tracheostomy would be necessary in any case at the end of the operation, it may often be considered the better expedient to do a preliminary tracheostomy under local anesthesia and to insert the metal tube with an inflatable cuff on it, so that the trachea is completely blocked off from the glottis and the larynx. Indications for such a maneuver are found in some cases of cancer of the intrinsic larynx, bulky pharyngeal growths and in cases of postradiation edema of the arytenoids and glottis

Balloon Cuff Anesthesia Tube (Fig. 40) This device is of particular value in total laryngectomy or in a second operation, such as neck dissection, following a previous total laryngectomy The device consists of a right-angled latex rubber tube with imbedded stainless steel coiled wire to prevent collapse or buckling. One end is bent at a right angle for insertion into the open trachea A replaceable balloon cuff, which is secured by wrapping a few turns of silk at each end, is located on the short section of the tube The tube is inflated through a built-in catheter of small caliber Eyelets are provided so that the short end may be sutured to the tracheal stump preventing displacement. The tube is of sufficient caliber to allow adequate respiratory exchange

POSITION OF THE PATIENT ON THE OPERATING TABLE

The proper placement of the patient on the operating table is necessary to insure an adequate exposure of the operative area A foot piece lift sheet, knee strap and armboard should be routinely used The field of operation should be made as prominent and accessible as possible There should be no pressure of the arms on the chest and no restriction of respiratory excursion by sheets or straps

The patient is usually in a dorsal recumbent position The head is on a somewhat higher level than the feet, thereby tending to lessen the blood pressure—particularly venous—in the head and neck, and so reduce blood loss in most operations in this area The bend of the neck should be over the hinge of the headpiece so that when the latter is raised or lowered the head may be either flexed or extended on the neck

A small pillow (3 x 4" thick) a rolled blanket, or sandbag, should be placed under the shoulders so the head drops backward, the chin remaining on a plane horizontal with the shoulders An exception to this rule occurs in procedures concerned with the skin of the face para nasal sinuses maxilla, and orbit, where the forehead and chin should remain on the same level The pillow or roll under the shoulders should be removed and the headpiece raised so as to flex the neck at the time of beginning the closure of such operative wounds as the pharyngeal opening following laryngectomy and the horizontal incisions in thyroid surgery (Fig. 579)

DRAPING OF THE PATIENT

The most important principle in draping the patient for operations about the head and neck is the placement of two superimposed and slightly overlapped half-sheets under the head and neck The bottom sheet is left to cover the head of the table and the top sheet is folded over the upper portion of the patient's face and scalp When the patient has long hair it is use

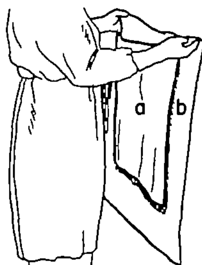
DRAPING THE PATIENT

wo half sheets or towels (*a b*) are held so that laps the edge of *a*

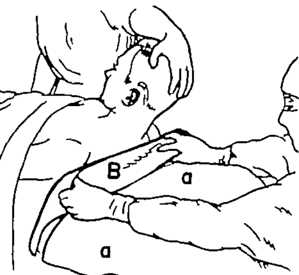
n assistant raises the patient s head and the pped edge of *B* is inserted under the shoulders

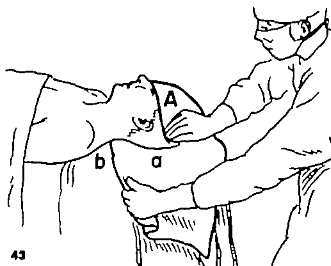
he top sheet or towel *A* is wrapped around the portion of the neck and face covering the eyes.

. sterile sheet *C* is drawn up over the body ut the nipple line

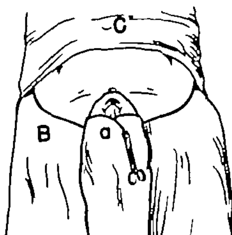


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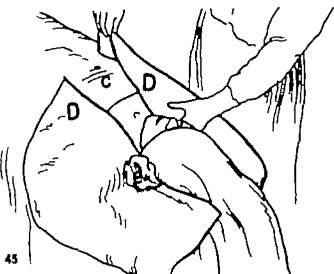


DRAPING THE PATIENT CONTINUED

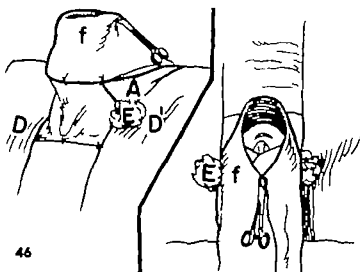
45 Towels (*D D'*) are placed in a vertical line over the shoulders Crushed towel *e* is placed at each side of neck

46 For operations on the midline of neck (larynx thyroid, etc) Folded towel *f* is sutured just below point of chin and turned back over towel *A* leaving ample breathing space

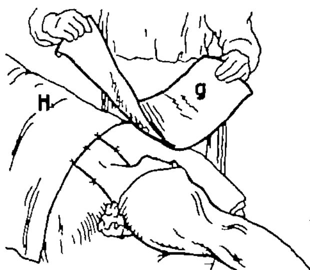
47 and 48 For operations on the side of the neck (neck dissections, etc) a folded towel *g* is again folded at an angle of 90° and sutured in place to expose only the side of the neck Towel *H* is placed over the chest wall.



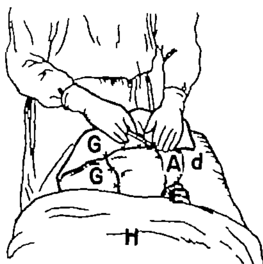
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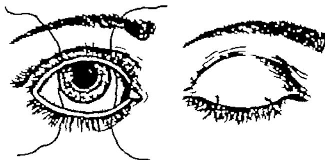
47



48

ful to apply first a length of gauze stockinette (Surgitube) to the head. The successive stages of draping are shown in Figs 41–48

In draping for operations on the neck (neck dissections hemithyroidectomy etc) it is important that the towel which is folded up over the sides of the neck and face be drawn tightly so as to seal off its lower edge and prevent hair from escaping downward to contaminate the operative field Care should be taken that the eyelids are closed, so that the towels covering the eyes do not come in contact with the exposed cornea. In certain cases temporary suture of the palpebral margins is advisable (Fig. 49) The lower border of the drapes should not be lower than the tragus of the ear and preferably should be above the auricle One common oversight of residents and nurses is to place this portion of the drape too far down on the neck in cases of thyroid tumor operations in which frozen section is intended If the test should be positive for cancer such inadequate preparation necessitates complete re-draping of the patient in order properly to expose the operative field for a neck dissection. It should be remembered that in all thyroid operations where frozen section is made there should be full preparation to proceed with neck dissection if the pathologist's report is positive.



49 Temporary suture of the eyelids. Temporary suture of the palpebral margins will serve as a complete protection against corneal injuries both during the operation and in the immediate postoperative period, while an eye is covered by a bulky dressing.

SELECTION OF INSTRUMENTS FOR AN OPERATION

Surgeons are prone to assume that the selection of instruments both in kind and quality is relatively easy—as a matter of fact, almost automatic. They may fail to realize that the scrub nurse must and does keep some kind of instrument list—sometimes a different list for each surgeon Moreover in resigned self-defense and on the basis of past experience with the temperaments of surgeons she may consider it prudent to boil up more instruments than are actually necessary—an illogical and costly method from the standpoint of wear and tear on both the instruments and the nurse—in the hope that she will not be caught unprepared should the surgeon call for some particular instrument

Nomenclature of Operative Procedures. On the Head and Neck Service of Memorial Hospital there are between forty and fifty operative procedures sufficiently different as to deserve specific lists of instruments in order that the scrub nurse may be properly prepared In general a standardized nomenclature is rather closely followed in scheduling operations so that the nurse may know exactly what is to be expected The most commonly used instruments such as hemostats retractors, needleholders and scalpels can be fairly well covered by Basic Set #1 for relatively minor procedures and Basic Set #2 for more extensive procedures Bone dental and tracheostomy instruments can be designated by "special" sets Beginning with one or more of the basic sets, the complete requirements for any particular operation may be satisfied by the addition of "extra" instruments and "special sets "

Names of Specific Instruments. One requirement in setting up instrument lists is to identify each instrument by a specific name Surgeons and surgical nurses sometimes resolve this difficulty more or less "by ear"—that is either by selecting the instruments from a vague visual impression, past experience, or by calling a given instrument by the name of the surgeon who happens to prefer it This results in referring to "Dr A s retractor" or "Dr B s needleholder " etc when as a matter of fact, the instruments may have appeared long ago in instrument catalogs under the name of the surgeons who first devised or invented them It is certainly a doubtful and rather presumptuous expedient to designate an instrument by the name of a given surgeon simply because he now prefers or habitually uses it

It will be found by comparing catalogs of various instrument dealers that most instruments

have fairly standard names, supposedly of the surgeon who first invented them Considerable effort was taken, therefore, in compiling the present section, to identify each instrument by the name assigned to it *by the majority of surgical instrument dealers* Once an illustration of an instrument has been located in one catalog, it can then be identified in the catalogs of most other dealers by comparing illustrations and names

Some special instruments have been devised by the author or by one of his colleagues and in order to be identified they must, therefore be listed under their names It is probable that many surgeons would prefer to use other but similar instruments with which they are familiar In this case, a close substitute or alternate can be selected by comparing the illustration in the catalogs of standard dealers

Included in the Appendix is a list of instruments required for various types of operations for head and neck tumors

BLOOD TRANSFUSIONS

With the intravenous system previously described under "Anesthesia (see Fig 35) everything is ready for the attachment of the flask of previously typed and matched blood The transfusion is started as soon as the operation gets under way or at a time selected by the anesthetist on the basis of blood pressure readings and other systemic factors There should be no predetermination as to the amount of blood to be given. Although at first thought it might be considered expensive it is a matter of common observation that the patient s postoperative recovery his sense of well being healing of the wound and his early discharge from the hospital are all promoted by a replacement equal to the blood loss Under such a principle at least one transfusion (of 500 cc) would be given as routine in the standard neck dissection. More blood, up to 4 or 5 liters, might be necessary with particularly extensive operations that are attended by greater blood loss Furthermore, as mentioned under Sump Suction Drainage (p 63), it should be realized that in the drainage of the first 48 hours following the "Commando" type of operation there may be a further loss of about 500 cc or even more of blood and/or serum In any case it may be accepted as true that 500 cc of blood given at the time of the operation is more beneficial than 1000 cc of blood given the following day

SKIN INCISION AND OPERATIVE EXPOSURE

Although most incisions for cancer surgery of the head and neck will be extensive a general consideration of the subject may properly begin with a statement of basic principles The simplest form of surgical incision is the straight line of which the curve and ellipse are modifications (Fig 50 A B and C) Straight or curved incisions should run obliquely downward and forward on the sides of the neck and horizontally in the middle of the neck (for example in exposure of the thyroid gland or thyroglossal cyst) and should be placed whenever possible in a wrinkle or crease of the skin

For partial or total laryngectomy the vertical midline incision is most useful modified in some instances by a short cross-arm (Fig 50E)

For wide exposure of the lateral aspect of the neck (neck dissection) the double trifurcate incision is the simplest and, cosmetically the most acceptable (Fig 51) The arms of the double trifurcate incision should be equally spaced at approximately 120 degrees

When neck dissection is combined with excision of a primary lesion in the mouth ("Commando") the lower lip should be split in the midline by bringing the upper mesial arm of the double bifurcate incision directly across the submental region up into the lip (Fig 52) Attempts to reduce the cosmetic deformity by not splitting the lower lip often result in an inadequate exposure and an unsatisfactory operation.

For deep exposure of the upper regions of the face (maxilla paranasal sinuses nasopharynx, etc) the Weber Fergusson incision is to be preferred The upper lip is split directly in the midline and the incision is then carried in a curved fashion around the ala of the nose up to the inner canthus (Fig. 53) If wider exposure is needed, the incision is extended into the skin of the lower eyelid following a line within 3 to 4 mm of the inferior palpebral margin If the skin edges are carefully sutured an incision so placed leaves but minimal visible scarring.

For operations on the parotid gland (Fig 456) the trifurcate or Y-shaped incision or some

BASIC FORMS OF INCISIONS FOR HEAD AND NECK SURGERY

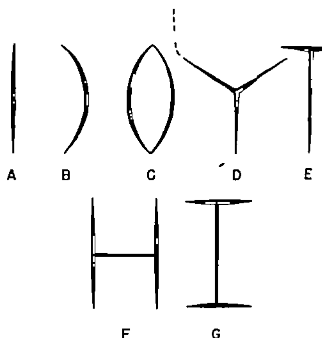
50 Most skin incisions for operations in any part of the body can be classified according to a few simple forms and their modifications *A* Straight *B* Curved *C* Elliptical *D* Trifurcate *E* T-shaped *F* and *G* H-shaped

51 The double trifurcate incision is the basic form of exposure for neck dissection or for any operation of the neck which includes a neck dissection

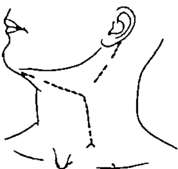
52 For the combination (Commando) operations on the neck and mouth, the upper anterior arm of the trifurcate incision is extended upward to split the lip in the midline

53 The Weber-Fergusson incision is the only adequate exposure for the maxilla.

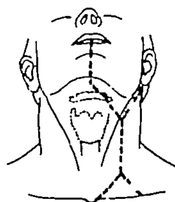
54 When areas of skin (irradiated or invaded by cancer) need to be excised, the double trifurcate incision may be modified conveniently at the time of neck dissection



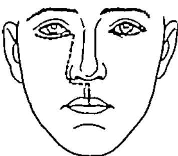
50 Basic surgical incisions.

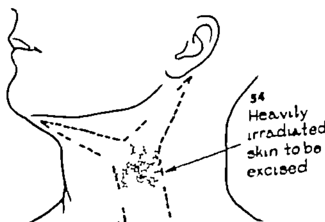


The double trifurcate incision



52 Modified trifurcate incision for combination operations.





FORM AND EXTENT OF MANDIBULAR BONE EXCISION

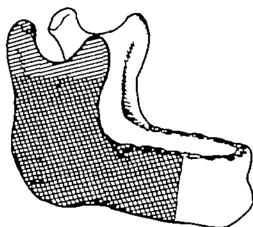
55 The most commonly used form of bone excision of the mandible is partial resection severing the ascending ramus below the temporomandibular joint If the lesion is of bone or posteriorly placed disarticulation may be made at the temporomandibular joint.

56 If the resection extends forward to or across the symphysis, the deformity may be considerably lessened if a step" form of excision is made, preserving the anterior mandibular arch

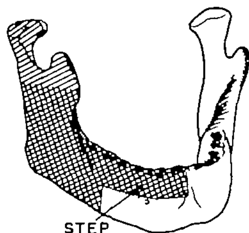
57 When both mandibles are resected, time is saved and bleeding is lessened if the section is made through the ascending rami, rather than to disarticulate at the temporomandibular joints

58 Various forms of marginal resection may be used when there is no deep invasion of bone thereby preserving whole the arch of the mandible

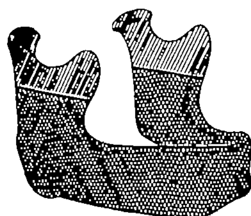
59 Segmental resections of the mandible are seldom indicated for cancer and when made for benign tumors the defect should be repaired by splint or graft.



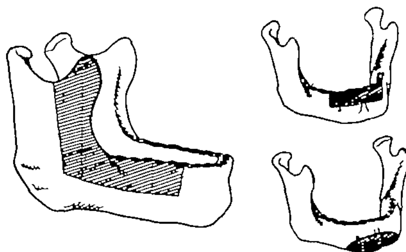
55 Partial resection.



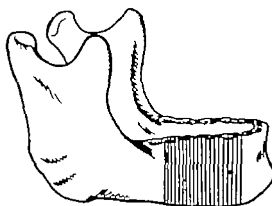
56 Partial and step resection.



57 Total or subtotal resection



58 Marginal resection.



59 Segmental resection

modification of it is almost always necessary The upper arms of the Y are placed just anterior and just posterior respectively to the lower attachment of the ear so as to permit blunt dis section around the outer surface of the cartilage and a displacement upward of the external ear The lower arm of the Y runs obliquely down ward and forward over the tail of the parotid, in some cases connected, if indicated, with a stand ard double Y incision for neck dissection A forward extension of the upper arm may be necessary in some cases

The surgical approach to the retromandibular area—as for example for parotid tumors of the deep lobe and soft part tumors of the pterygo-maxillary fossa—is complicated by the risk of injury to the seventh nerve Such a risk can be minimized if the main trunk and the plexus of the seventh nerve are directly exposed and kept under observation retracted and protected dur ing the surgical manipulations The only means of exposing the seventh nerve for such direct observation is by making a preliminary super ficial parotidectomy (Figs 456–460) a proce dure for which the competent surgeon does not require a great deal of additional time There is no loss of function following superficial parot idectomy and in experienced hands no risk of permanent injury to the seventh nerve

The basic surgical approach to the thyroid is through a horizontal collar incision which may be modified if indicated to connect with the standard double Y incision for neck dissec tion

The incisions described above are about all that can be standardized for head and neck surgery They will fit the majority of operations on the head and neck but it is obvious that in individual cases other modifications or special incisions will be required In surgery after radi ation therapy it is sometimes possible to modify skin incisions so as to remove the greater por tion of the heavily irradiated skin and thereby promote better healing and lessen the chance of subsequent superficial radionecrosis (Fig. 54)

Hemostasis, Ligatures, and Knot Tying: *Endothermy* There is a more copious blood supply in both the superficial and the deeper tissues of the head and neck than in most other portions of the anatomy For this reason in extensive operative exposures of the head and neck there is a tendency toward the accumulation of a great numbe- of hemostats in the operative wound, often to the degree of seriously inter fering with the surgical manipulations. With a well functioning operative team time is saved if the bleeding points are ligated whenever as many as a dozen clamps have accumulated It is well to tie immediately the smaller thyroid veins and those that emerge from the pharynx at the level of the hyoid bone to prevent the clamps being accidentally torn loose from their rather fragile attachments Even the moderately large arteries which are frequently sectioned in radical head and neck surgery (e g., the external maxillary lingual superior thyroid inferior thyroid transverse cervical and transverse scapular as well as the external carotid itself) should be doubly ligated Double ligatures should also be used for the upper and lower ends of a resected internal jugular

The large number of clamped bleeders that must be tied in major surgery of the mouth pharynx, and the neck is such that speed and proficiency in the tying of knots is an important factor in good technic In our clinic repeated counts have shown that in radical neck dissec tion the average number of separate knots tied from beginning to end (skin to skin) is about 150 When neck dissection is combined with the resection of the lesion within the mouth or larynx ("Commando") the number of knots may go to 225 to 250 With double or triple ties in each knot, the number of separate manipula tions may be as high as 500 to 600

The number of tubes of catgut necessary to provide 150 to 250 knots depends to a greater extent than ordinarily realized upon the method of tying. Careful observation of a series of senior surgical residents has revealed that with a single tube of catgut rolled on a spool using a one handed technic from 16 to 20 knots may be tied With a two-handed technic using a con tinuous string of catgut 10 to 14 knots are ob tained from a single tube For separate single ties the average surgical nurse will cut one tube of catgut (54" long) into four lengths of slightly more than 12" each and in the latter case only four ties will be obtained from a single tube The variation in expenditure of catgut depending upon the above mentioned different methods of tying therefore is about 1 to 5 With catgut at its present-day (1955) price of about 38¢ a tube the cost of catgut depending upon the technic used may vary from $4 00 to $20 00 in extensive head and neck operations

For these reasons it is my opinion that the technic of one handed knot-tying is of importance for the purpose of saving both time and material. Most older surgeons, by reason of long practice, have probably become so habituated to a particular method of knot tying as to resist any change, no matter what the advantages. The surgical resident who wishes to practice head and neck surgery (or as a matter of fact, any type of surgery requiring a great number of ligatures) would do well to perfect his skill in one-handed knot-tying, preferably by the left hand if he happens to be right handed

Expense is also saved by the use of cotton or silk on the specimen side of a neck dissection or by the use of endothermy to coagulate rather than to tie the bleeding points on the specimen. Some competent surgeons coagulate all bleeders, except the larger vessels, and insist that the healing is in no way delayed. Possibly this is true, but I have always felt more confident with the use of absorbable ligatures Nonabsorbable materials, such as cotton or silk, while not highly objectionable in clean surgery where no drainage is required should not be used in contaminated wounds (such as those of combination operations entering the mouth) or even in operations where copious serous drainage occurs such as in neck dissection

SPECIFIC REASONS FOR THE EXCISION OF BONE IN HEAD AND NECK SURGERY

There may be reasons other than direct invasion by cancer for the resection of bone of the mandible or maxilla as for example, to gain access to the operative site for the removal of soft tissues or to obtain the release of soft tissues so that they may be shifted later to replace defects and to permit primary closure of the operative wound

Invasion of Bone by Cancer The most common indication for excision of bone is direct invasion by disease—as for example in the resection of the mandible in cancer of the floor of the mouth and gum and the resection of the maxilla in whole or in part for tumors of the nasal cavity and paranasal sinuses In many instances such removal of bone may serve the additional purpose of providing access to the tumor itself (paranasal sinuses) and of permitting a shift of soft parts, such as the base of the tongue to repair the defect following excision of cancer of the tonsil

For Access to Operative Site When in the course of the average combination operation for cancer of the floor of the mouth or lateral aspects of the tongue the mandible is sectioned for the removal of the posterior portion of the ramus better access is provided immediately by permitting lateral retraction of the segment of bone and the wider separation of the tissues in the floor of the mouth and the deep portions of the base of the tongue.

In the lateral approach sectioning the body of the mandible at the level of the second or third molar permits the retraction of the ascending ramus giving access to the pterygomaxillary space and also to the lateral wall of the pharynx in lateral pharyngotomy Should there be any question of invasion of the bone by disease the posterior fragment should obviously be resected. Resection of the ascending ramus also serves to facilitate shifting of soft parts in the primary closure in such cases When the mandible is sectioned in this way to permit retraction for access to the pterygomaxillary space to the deep lobe of the parotid gland or to the nasopharynx, the fragment may be reunited and held by metal sutures placed through previously drilled holes (Figs. 313–316) Surgical access to the paranasal sinuses and the nasal cavity is obviously impossible without some resection of bone of the maxilla

To Permit Shifting of Soft Tissues to Facilitate Closure The best example of resection of bone to permit shifting of tissues for closure of the mucosal wound is marginal resection of the mandible (resection of the bony alveolus) (Figs 283–287) This maneuver eliminates the zone of fixation of the gum tissues to the alveolus and permits shifting the mucosa of the floor of the mouth laterally so as to close a defect in the mucosa of the cheek The same maneuver may be used in cancer of the anterior floor of the mouth so that the undersurface of the tongue may be shifted across the mandible to join the mucosa of the lower lip (Figs 381–386) After resecting the ramus fairly large tissue defects from wide excision of the tonsillar area and/or soft palate may be closed by a lateral shift of the adjacent base of the tongue (Figs 367–371)

Form and Extent of Mandibular Bone Excision. Excision of one or both sides of the mandible (whole lower jaw) may be necessary for complete excision of a growth and/or a shift of soft tissues to close the defect Nevertheless there are a number of less extensive resections of a part of the mandible which may serve equally well in less extensive growths and thereby lead to a lesser degree of deformity and disability In Figs 55–59 are shown various useful forms of mandibular bone excisions It should be noted that a *marginal resection* makes possible a retention of the mandibular arch, and that an excision leaving a rim (step) (Fig. 56) of bone at the symphysis will provide a support for the chin When one or both sides of the mandible are resected there is little to be gained by choosing a disarticulation at the temperomandibular joint rather than a section of the ramus just above its mid-point The residual fragments, consisting mainly of the condyloid and coronoid processes cause no untoward aftereffect while by their retention time is saved and the amount of bleeding from this area is reduced

The *segmental resection* of the mandible (Fig. 59) as opposed to the *subtotal resection* (leaving in the posterior portion) is seldom justified unless a buried splint is applied

Partial or Complete Excision of the Hyoid Bone The hyoid bone serves as a point of attachment for a number of muscles and ligaments among which are the omohyoid, sternohyoid thyrohyoid stylohyoid geniohyoglossus and the middle constrictor muscle The ligamentous and membranous attachments are the thyrohyoid membrane the stylohyoid ligament and the tendon of the digastric muscles

The multiplicity of these attachments might suggest that the functions of the hyoid bone are highly important and that its loss would result in serious dysfunction. As a matter of fact the hyoid bone can be removed either in toto or in part without any appreciable functional loss. While in the greater number of major operations on the neck there is no benefit in its removal, the excision of the central portion is essential for the complete excision of the sinus tract in thyroglossal duct cyst. To facilitate clearing out of the "pre-epiglottic space," Clerf has recommended total excision of the hyoid bone in total laryngectomy for cancer of the extrinsic larynx —a precaution certainly prudent when the growth deeply invades this area, but I think hardly necessary in the average case of total laryngectomy

One of the main benefits to be derived from excision of the hyoid bone is the increased mobilization of the base of the tongue so as to facilitate its anastomosis with the anterior margin of the esophagus in wound closure after extensive pharyngolaryngectomy Without this procedure skin grafting on a stent or a semipermanent pharyngostome would be required

Partial Resection of the Clavicle The mesial end of the clavicle lies above the level of the first rib but nevertheless does not seriously impede access to the root of the neck in the average neck dissection When neck dissection is combined with axillary dissection (Figs. 87–88) the clavicle must at least be sectioned, or preferably its mid-portion resected Resuture of a sectioned clavicle is impractical and does not greatly lessen the deformity and disability while often seriously interfering with healing It is seldom of advantage to disarticulate at the sternoclavicular joint, and the outer third of the clavicle should always be left in place There may be a variety of indications for partial resection of the clavicle in the attempt to mobilize bulky or deep-seated tumors in this area *

PERIPHERAL AND DEEP 'SAFE' MARGINS FOR EXCISION OF CANCER

The advisable and at the same time permissible "safe" margin for the excision of cancer will obviously vary greatly with the anatomic structures involved A common example of a wide margin is the amputation of the entire breast rather than the local excision of a malignant tumor within it This is indicated not only because a wider margin is "safer" but also because a partial excision of the breast leaving a scarred asymmetric gland is neither functionally nor cosmetically superior to complete amputation. Likewise in cancer of the gastrointestinal tract the removal of long segments of bowel (wide margin) is not functionally objectionable in most cases In cancer of an extremity high amputation is often preferable or

* I have had one case in which it was necessary to combine an interscapulo-thoracic amputation of the shoulder girdle with neck dissection in a case of recurrent metastatic cancer of the breast. The patient has survived nine years after the operation without recurrence.

only slightly less desirable from the functional standpoint than a more conservative version (narrow margin) In these examples the permissible "safe" margin may be 5 to 10 cm or more beyond any visible or palpable border of the tumor

In cancer surgery of the head and neck, on the other hand one must deal with much narrower margins so as to avoid unjustifiably great cosmetic and functional disabilities For instance, in cancer of the lip a margin of 5 to 6 mm of palpably normal tissue must suffice in most cases In tongue cancer a "safe" margin of 1 cm or more is usually practical except when the growth approaches such structures as the floor of the mouth, the bone of the alveolus the tonsil or the larynx * In the latter instances no specific rule of distance can apply absolutely one can hardly make a decision beforehand as to whether to remove the larynx with the base of the tongue or to choose a Commando type of operation including the resection of the mandible, in order to gain a margin of 1 to 2 mm The decision in such cases must be empiric and the surgeon must individualize the case and take responsibility for the more radical operation if there is no other way to obtain a "safe" margin

In radical resection of the maxilla which includes removal of the cribriform plate, it would be foolish to extend the margin of the excision into the cerebral cortex on the basis of a rigid rule In borderline cases, therefore the surgeon may elect to chance a narrow margin rather than to run the risk of greater and more serious complications and additional disability by entering into an entirely different surgical plane Permanent control has been obtained by the use of both wide and narrow margins. A margin of 1 to 2 cm of tissue that is free from all visible and palpable evidence of growth though generally advisable is frequently not possible in surgery of the head and neck without unjustifiably compounding the surgical risk In brief there can be no universally applicable "safe" margin for surgical excision of cancer

Cosmetic Appearance and Restoration of Function versus Adequately Wide Excision of Cancer In radical surgery for cancer there often must be a compromise between preservation of function and/or cosmetic appearance and achievement of a margin reasonably wide enough to encompass all the disease regardless of cosmetic appearance and interference with function. This subject will be discussed at some length in another chapter in relation to the sacrifice of such structures as larynx, tongue eye etc. but it deserves separate emphasis at this point with regard to cancer of the skin of the face

It is a common experience to find that plastic surgeons who are habitually concerned with the correction of benign cosmetic defects find it rather difficult to disregard these esthetic principles in dealing with cancer of the skin of the face As a result, many patients are found to have widespread recurrences of basal-cell cancer in and about the scars following a series of cosmetically satisfactory operations in the regions of the nose or eyelids The control of the disease in such recurrent cases cannot be achieved until some surgeon takes over who will operate with the primary and single purpose of completely excising the growth and making the best of the resultant cosmetic defect. It has often been remarked that in such difficult cases one surgeon should excise the growth without regard to the problem of repair and that the second surgeon could immediately take over to close the defect The purely objective well balanced surgeon should be able to play both parts

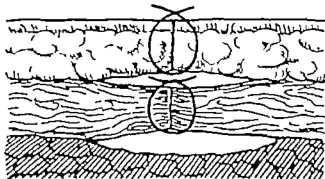
CLOSURE OF OPERATIVE WOUNDS OF THE HEAD AND NECK

Present-day technics and the facilities now available for combating infection (antibiotics local use of activated zinc peroxide, oral hygiene etc.) make it possible to obtain primary healing or epithelization by skin grafting of raw surfaces in most radical operations which involve the oral cavity

As is shown in Chapter 21 on Operations on

* The actual width of a measured surgical margin will vary greatly depending upon whether the measurement is made with the anatomic part in its normal relaxed position, or whether it is made with the tissues on a stretch The latter is necessarily the case during manipulations incident to such procedures as partial glossectomy or total laryngectomy It is a common experience that when the surgeon examines the surgical specimen he will at least be momentarily dismayed by what appears to be an unexpectedly narrow margin in the relaxed and retracted mucosa.

the Larynx, most operative wounds—such as those which follow resection of the larynx and/or portions of the oral or pharyngeal walls or of the upper esophagus—can be closed primarily with a much lower morbidity and greater chance of complete closure in the healed state than



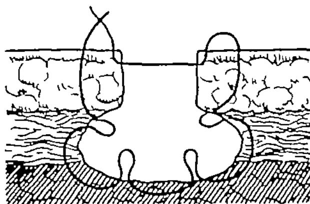
60 Layered closure. The layered closure often results in leaving dead spaces in which serum and blood accumulate and at best a depressed and unsightly scar results.

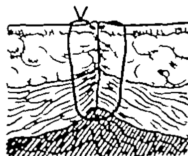
by resort to semipermanent pharyngostomes (Wookey Portmann) although the latter expedients may be occasionally required. One of the main factors in prompt healing of wounds opening from the neck into the mouth is the meticulous approximation of the mucosal edges supported by firm layered closure of the underlying soft parts.

One of the cardinal principles of modern head and neck surgery is that all operative wounds involving the upper respiratory and alimentary tracts should be closed immediately or where such closure is not possible, all raw surfaces should at least have an epithelial covering either by suturing skin to mucosa at the edge of the operative defect or by applying a skin graft to the raw surface Such a rule is of equal significance whether the operative wound be the result of an excision of a small basal-cell carcinoma of the skin the extensive removal of the larynx and adjacent pharyngeal walls, excision of a bulky primary growth in the mouth combined with resection of the mandible and neck dissection or a radical excision of the maxilla and orbit.

Prior to the introduction of chemotherapy it was prudent in most cases to leave such contaminated wounds "wide open" to heal by *secondary intention* Twenty years ago a layered closure of the soft parts in operative incisions extending from the neck into the mouth or pharynx would have been hazardous because of the danger of deep cellulitis after the necessarily inadequate drainage. By the full use of our present-day facilities such wounds can and should be closed in layers with the expectation that solid healing will not be greatly delayed, and without the risk of deep cellulitis This principle has eliminated most of the indications for endothermy and cautery in the excision of skin cancers and growths within the mouth.

Another technic in the closure of wounds of *the superficial soft tissues* (or occasionally of operative sounds entering a body space) made practical by the advent of chemotherapy is a composite stitch (Fig. 60–61) The purpose





61 The composite stitch The composite suture (*above*) is applied in a single layer multiple bites being taken around the edges and the depths of the wound to produce a purse string effect, eliminating all dead space (*below*)

here is to obtain approximation of soft tissues and the elimination of the dead space which might otherwise be the seat of local collection of blood or serum

In closing the skin itself the use of alternating vertical mattress and simple superficial

stitches—a maneuver producing a balance of eversion and inversion—will in general provide most satisfactory healing

In wide surgical defects of superficial tissues —for example of the scalp, where skin grafts are to be used—the area of raw surface can be markedly reduced by the use of pursestring sutures (Fig. 153) Skin clips find their main usefulness in collar incisions for simple thyroid surgery Nylon sutures being chemically inert, are probably the most suitable material yet devised for removable skin sutures In the closure of mucosal incisions within the pharynx, where sutures are difficult or impossible to reach for later removal fine chromic catgut is indicated Mucosal wounds within the mouth which are accessible to later removal are best sutured with nylon

THE PULL-THROUGH TECHNIC

If one were to accept the theory of lymphatic permeation as a reasonable explanation of the means by which cancer disseminates then logically it would follow that one must excise the primary lesion the metastases and all the intervening lymphatic channels *in continuity* Such a concept has had ardent advocates in Sampson Handley as regards cancer of the breast, and in Bloodgood, who at one time stated that cancer of the tongue that had already metastasized to the cervical nodes could not be cured except by the total excision of the intervening lymphatics Many cures of metastatic cancer both of the breast and of the tongue and other head and neck sites have proved the concept of lymphatic permeation to be of little practical significance In brief the hundreds of cases of permanent cure following discontinuous and separate surgical removal of the primary lesions and regional lymph node metastases prove conclusively that metastasis of carcinoma is by tumor emboli which pass quickly through the lymphatic channels to be caught and arrested by regional lymph nodes the intervening channels remaining free of disease unless and until another tumor embolus becomes detached.

Acceptance of the theory of lymphatic permeation has led Wookey and others to advocate the so-called "pull-through" operation, that is, in combination operations (excision of a primary in the lateral tongue and/or floor of mouth) the oral specimen is left attached and pulled through a surgical aperture mesial to the body of the mandible so that it is left attached to the submaxillary triangle portion of the neck dissection specimen. By this means (it is assumed) the lymphatic channels between the primary and the cervical lymph nodes will also be resected

In practice, such an attempt usually fails its professed high purpose If left intact the continuity of the mandibular arch so restricts the operation in the floor of the mouth that an adequately wide and therefore fairly bulky specimen must be "pushed through" rather than "pulled through requiring a great deal of massaging and in so doing the tissues between the tongue and the submaxillary portions become so attenuated as to often tear apart As an alternative resection of the posterior portion of the mandible will permit a much wider excision in continuity of lymphatics if the surgeon so desires It is the considered opinion on our Service that the "pull-through" operation (Figs 394–397) has little practical significance in the surgery of mouth cancer

LIGATION BY WIRE OF THE RESIDUAL STUMP IN CYSTIC CERVICAL LYMPH-HYGROMA

The morbid anatomy of cystic cervical lymph hygroma is so variable as to render the attempt at description by illustration impractical In any given case the cysts are always multiple varying in size from a few millimeters to several centimeters in diameter Such a honeycombed mass, although histologically benign tends to infiltrate all tissues—muscles and nerves, as well as blood vessels—and will sometimes spread back into the retroesophageal area and down into the mediastinum It is not possible in most cases to establish by preoperative examination the exact extent of the growth Attempts at surgical removal of these lesions may in certain cases be one of the most frustrating experiences for the surgeon. Unless the lesion happens to be superficial and relatively noninfiltrating, one may often be tempted to go "on and on just a little further" only to find that the lesion extends even more deeply so that persistent attempts may result

in serious complications In operating upon hygromas the prudent surgeon will therefore, be attentive to the proposition that it may be far better not to persist too far in a difficult situation If he must cut across a collection of cysts there is the risk that the secretion of lymph will continue to pour into the wound with a tendency toward a permanent fistula and eventual infection Such persistent leakage can be prevented by ligating the residual stump of hygroma with wire so as to effectively seal it off If the seepage of lymph can be prevented by such nonabsorbable ligature primary healing can be expected.

ISOLATION OF THE ORAL CAVITY BY PRIMARY CLOSURE OF THE PHARYNGEAL OPENING

In some cases of radical excision of the more advanced growths of the larynx and pharyngeal wall and upper esophagus the surgeon has the choice between the placement of a skin graft on a stent or of leaving the pharyngostome wide open implanting the upper end of the severed esophagus into the skin of the lower neck (Figs. 517–518) In the latter cases the hope is that the patient will remain free of recurrence so that eventually a channel may be re-established between the oral cavity and the esophagus Since most of the lesions in which this radical procedure is performed are far advanced, the chance of recurrence is so great that beginning the multiple operations required for reconstruction is hardly justified until a year or more has passed without recurrence During this period all the oral secretions drain through a wide pharyngeal opening above down onto the neck requiring frequent changes of dressings which only partly relieve the nuisance of these copious discharges

One of the troublesome complications of a wide open pharyngotomy is the juxaposition of the esophageal and tracheal stomas so that any regurgitation of the ingesta tends to spill forward into the immediately adjacent tracheal stoma In some of our cases fatal complications (bronchopneumonia) were initiated by such spillage One method of preventing this complication is to detach the upper end of the esophagus and bring it out through a separate lateral opening in the skin so that should regurgitation occur the spillage will be down the chest wall lateral to the tracheal opening (Fig. 517)

It has recently been established in our clinic that if the pharyngeal opening above is closed sealing off the oral cavity so that all oral secretions must be spat up the patient is relatively more comfortable than with a pharyngostome As a matter of fact few patients complain markedly because of the necessity of evacuating the accumulated saliva and most of them state that they sleep comfortably through the night without having to empty their mouths In these cases additional comfort is promoted by ligating the parotid ducts (Fig 113) thus even further reducing the quantity of mouth secretions

If at any subsequent time reconstruction of a channel between the mouth and esophagus is undertaken the new opening through the old suture line from the anterior neck into the mouth is quite readily made

MARSUPIALIZATION OF BENIGN BONE CYSTS

In rare instances unilocular benign radiculodental cysts of considerable size may occur in the maxilla or mandible If it can be established roentgenographically that there is no multiplicity of cysts the surgeon may cautiously approach such lesions with the purpose of unroofing them and without curettage leave intact the epithelial cyst lining at the base The decision to use this conservative procedure can only finally be made after tentative exploration to establish that the cyst is unilocular and that the lining membrane is actually smooth To unwittingly marsupialize a cystic adamantinoma would be an inexcusable error The occurrence of large benign cysts suitable to marsupialization is so rare and so varied in morbid anatomy as to render an attempt at any further detailed description of the operative technic } worthwhile

EXPLORATORY LARYNGOFISSURE IN CANCER OF THE INTRINSIC LARYNX

Laryngofissure is practically never indicated initially for diagnostic purposes since mirror endoscopy followed in suspicious ca biopsy through the [illegible] would

serve to establish the diagnosis of cancer if present. On the other hand, in some histologically proved cases of moderately advanced cancer of the intrinsic larynx it may be difficult to establish preoperatively the degree of subglottic extension and therefore to decide preoperatively between the conservative operation of partial laryngectomy and the more radical and disabling total laryngectomy In such situations the uncertainty may be resolved by making a laryngofissure as an initial step and if after such adequate exposure the findings would seem to justify a conservative operation, then a partial laryngectomy is made, or one may proceed with a total laryngectomy if the subglottic extension appears to contraindicate the less radical procedure Too frequent resort to preliminary laryngofissure should be avoided for the reason that a division of the thyroid cartilage in the midline makes the subsequent surgical maneuver of total laryngectomy somewhat awkward and tedious even though the completed operation and the eventual end results are about the same

RESECTION OF A THYROID LOBE TO FACILITATE SURGERY IN THE ROOT OF THE NECK

An even moderately enlarged thyroid lobe will often be troublesome during the manipulations incident to surgery in the root of the neck as for example in total laryngectomy or in the excision of esophageal diverticulum A bulky thyroid adenoma in such cases seriously interferes with the success of the operation especially in the formation of the tracheal stoma after laryngectomy It is our practice therefore to resect a thyroid lobe routinely if and when such resection would appear to facilitate the main purpose of the operation and the closure of the wound As will be seen in Figs 507 and 513 thyroid lobectomy is the routine in total laryngectomy combined with neck dissection As compared to the main objections to such cancer operations the after-effects (if any) of hemithyroidectomy are insignificant. The occasional case of moderate hypothyroidism is readily relieved by replacement therapy

VARIOUS RECONSTRUCTIVE PROCEDURES

Radical cancer surgery of the head and neck is often mutilating and followed by serious cosmetic and functional defects Careful selection and application of operative technics can do much to reduce the degree of these disabilities at the time of the original operation In other cases the repair of the defect must await healing and a reasonable interval so as to minimize the risk of local recurrence *

Skin Grafts for Operative Defects of the Maxilla Orbit and Mouth With one of the modern dermatomes (Padgett, Reese etc.) employing the drum principle, split skin grafts of uniform thickness may be readily obtained up to 10 × 20 cm., a size sufficiently large to cover almost any operative defect involving the maxilla and paranasal sinuses Such grafts if accurately placed in transmaxillary defects and fixed by suturing and firm even pressure, will "take" over almost any kind of living tissues (bone fascia tendon muscle fat, dura cerebral cortex etc) The packing over the graft should be left in place for about six days The graft provides an immediately satisfactory covering dressing, markedly shortens the morbidity prevents extensive scarring and contracture of the cheek and improves considerably the eventual cosmetic and functional result in these cases

For large defects of the lateral (cheeks) or anterior (lips) aspects of the mouth where immediate closure cannot be effected, attempts should be made to approximate skin and mucosa at the periphery of the defect or to apply skin grafts to reduce the morbidity and postoperative scarring and contracture Final repair of such temporary defects is best achieved by tubed pedicle grafts

The most common indication for skin grafting within the mouth or pharynx is in partial or subtotal resection of the maxilla, often asso-

* Personally I find it difficult to escape the conclusion that excessive or too frequent resort to more complicated and technical procedures, such as skin grafts for pharyngeal defects, skin grafts to the surface of the tongue or buccal surface, metal splints or bone grafts in mandibular defects, and particularly the *use of nerve grafting* for seventh nerve defects, is not characteristic of the mature and resourceful surgeon. The relative frequency with which it is employed is often in inverse proportion to the surgical experience and perspective of the operator

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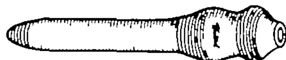
ted with *exenteration of the orbit. If the raw* ;face of such wounds is left to heal by granu- ion, the morbidity and the necessity for costly spital care are markedly increased.* The raw face in such wounds may total 40 to 50 uare cm Most of the surface is splinted by derlying bone and is in part a rigid walled vity which will permit firm, elastic pressure er packing. Both the latter conditions are vorable for the "take" of a skin graft In these ses large split grafts are essential—conditions uch can be met only by the use of dermatomes sed upon the drum principle The graft should sutured into place along all borders where ere is an epithelial margin (Figs 439 and 2) When the orbit has been exenterated the n of the upper eyelid remains and the begin- ng suture to the graft is here. Posteriorly the argin of the graft is sutured to the cut edge of hard and/or soft palate, continuing on to mucosal margin of the cheek The skin of lower eyelid should be inverted and sutured the inner surface of the cheek flap anterior attempt should be made to obtain a small bital opening. Experience has shown that a ger orbital opening—5 cm or more in diam er—is no more difficult to conceal by the use a patch than a 2 or 3 cm opening. The larger ening is useful not only for adequate ob- vation of the walls of the deep defect, but o as an avenue for the introduction of a under should radiation therapy be indicated recurrence of the growth

After application of the skin graft, a firm cking of fluffed gauze, mechanic s waste, or a oprietary material marketed under the name Cornish Wool can be more firmly secured if tures along the lower margins of the defect are t long and tied over the packing. The im- ediate dressing and packing over the skin graft ould not be disturbed for about six days.

Few other practical applications of skin graft ; will be found for defects within the mouth the first place the success of a skin graft in st of these areas will depend upon immo- ization by the application of firm constant essure of the overlying packing, an ideal ich is difficult to achieve unless the operative *defect is in the region of the maxilla.* In the second place a split skin graft applied to an oral defect whose base is not bone will contract so markedly within a short time as to be little superior to the same wound if left open to heal by granulation and scarring. Full thickness grafts do not take well within the mouth.

Split skin grafts for pharyngeal defects are discussed under a separate heading. The degree of success leaves much to be desired for reasons similar to those given above—first, no certain firm pressure can be applied to a graft in the hypopharynx, and second, the split skin graft in this area, even if the "take" is good, tends to contract so as to produce stricture.

Skin Grafts on Stents for Closure of Annular Pharyngeal Defects. With the more widespread practice of radical surgery for advanced laryn- geal and pharyngeal growths there has been *considerable interest in the attempts at replace* ment of annular defects of the pharyngeal tube by skin grafts held in place on metal or plastic stents (Negus Edgerton Hadfield Bisi Lewis) Among the various shapes and materials used in such stents that of soft rubber devised by Negus is probably the most practical (Fig. 62) In



62 Negus latex stent for pharyngeal skin grafts. The most practical form of stent for holding pharyngeal skin grafts is of a shape devised by Negus and constructed of latex.

most advanced laryngeal and pharyngeal growths requiring annular resection of the pharyngeal tube there is associated cervical metastasis so that a neck dissection must also be performed, *and on the corresponding side* the graft must, therefore, receive nourishment from and become attached to the subcutaneous flap of the neck dissection thereby reducing the chance of a *full* "take" Even *though this* handicap should be overcome the skin graft must of necessity be of the split variety Split grafts tend to contract even if the lines of union above and below *should heal* by pri- mary union. In few cases can the "take" of

* There still remain a few surgeons who oppose the use of skin grafts for maxillary defects for the illogical ison that the epithelial covering (it is alleged) would make it more difficult to discover early recurrences. a matter of fact, the reverse is true Early recurrences are more readily discovered should they appear under skin graft rather than in an area of exuberant granulation tissue which would have a far greater tendency mask the true character of a recurrence.

the graft be complete, and a combination shrinkage and stricture by scarring is common. To reduce the degree of such shrinkage and stricture, the stent must be left in place *for two to three months, or even longer* Even after this period strictures are common requiring daily bouginage and sometimes tube feedings Although there will be some successes, in general neither the immediate nor the long range over all end results are too encouraging, and the procedure should be limited to those cases in which there is no better alternative

In the Head and Neck Service at Memorial Hospital several forms and shapes of stents have been employed and several technics have been tried In a few the functional results have been reasonably acceptable The majority however will entail indefinite bouginage or tube feedings, and this raises the question whether in most of the cases one of the several alternatives would not have been preferable As the skillful and resourceful surgeon becomes more experienced, the less often will he resort to skin grafting for pharyngeal defects rather than a primary closure by some other expedient Immediate primary closure is often possible even in annular defects by mobilizing the upper end of the esophagus and bringing it up with the neck in flexion for suture to the upper edge of the defect at the base of the tongue In other cases it may be possible to leave a narrow strip of mucosa on the posterior wall to use as a starting point for beginning suture and complete closure Large operative defects of the anterior pharyngeal wall such as those which follow resections of post-cricoid growths can often be closed primarily by conserving the epiglottis and parts of the intrinsic larynx (subtotal laryngectomy) (Figs 532–539 540–548)

Where excision of the posterior wall has been wide and the anterior wall somewhat narrow the anterior and lateral walls alone may be closed leaving the posterior wall as a raw surface In such cases an excellent functional result may be expected, since the posterior wall, lying on the bodies of the spine cannot contract.

Some large and mainly one-sided defects can be only partly closed, leaving a small opening to the edges of which the skin flaps are sutured, leaving a fistula of only moderate size (1 to 2 cm) In the healed state the edges of such a small opening can be closed either by a "trap-door" form of maneuver or by bringing up a pedicle tube flap *In rare instances, it may be* preferable to leave two openings, one, a pharyngostome above at the base of the tongue, and the second an esophagostome just above the clavicle, the two separated by 8 to 10 cm of skin Such cases will occur mainly in the extreme range of radical pharyngolaryngectomy In such cases a new pharyngeal channel is probably best formed by two lengths of tube pedicles lying side by side and fused in stages to the skin of the neck and to each other (Figs 133–138) In the Wookey type of closure the new channel is formed by flaps of skin developed from the neck itself. In brief, if the most suitable of several alternatives is selected for a given case most pharyngeal defects can be closed primarily without resort to skin grafts on stents or one of the elaborate procedures above-mentioned. Even though in some cases a temporary fistula will follow these attempts most of them will close spontaneously Small, permanent fistulas are readily closed with an end result that is likely to be superior to that following skin grafts on stents

Rotated or Sliding Flap Grafts. For excising skin lesions of small or moderate size of most areas of the face the best solution is a simple ellipse whose long axis is in line with natural wrinkles or folds in the skin (Figs 154–156) This is particularly true in such sites as the forehead the cheeks, and the neck, as well as for smaller lesions anywhere about the face In certain sites however the skin and subcutaneous tissues are not particularly mobile, as for instance around the bridge or alae of the nose or there may be a critical disparity between the size of the lesion and the required operative defect or the anatomic part (for instance in the skin of the upper lip or the lower eyelid) When a fairly wide *excision in these situations* is closed by drawing together adjacent parts undue functional or cosmetic disability will result. In the latter case some replacement by shifting neighboring tissues from a less critical area may be the best *compromise To accomplish this purpose* and to circumvent the disadvantages of simple approximation, one may employ the rotated pedicle flap an advanced pedicle flap or skin graft.

Of these measures *the rotated pedicle flap is* probably the most frequently applicable (Figs 159 and 164) Such rotated flaps are seldom indicated if the defect is less than 1 × 2 cm in

size They are most useful if the rotation is through an arc of about 90 or less When rotated through a wider arc—up to 180°—there is an increasing tendency toward formation of "dog-ears" and associated cosmetic disad vantages which may require subsequent plastic correction

Useful examples are the rotation of a flap lying along the nasolabial groove on to the lateral aspect of the ala or the side of the nose from the nasolabial groove on to the skin of the upper lip from the upper eyelid to the lower eyelid or on to the bridge of the nose or from the upper to the lower eyelid around the inner or outer canthus of the eye (Figs. 164–165) Few indications will be found for the rotation of flaps from the lower to the upper eyelid. Other indications for the use of migrated flaps are within the region of the posterior cheeks and ear (Figs 176–177)

Simple advancement of tissue flap finds its main usefulness in the repair of larger lesions of the lower cheek or chin This maneuver usu ally results in the formation of dog-ears" at the base of the flap which in most cases can be largely eliminated by excision of wedges

The principle of the rotated flap can occa sionally be applied within the mouth as for instance in operative defects of the buccal mucosa or in the tonsillar area Klopp has de vised a procedure utilizing a lateral tongue flap with its base posteriorly which is rotated upward to fill operative defects in the tonsillar area and soft palate The basic principle is sound and it has been successfully employed in several instances on our Service at the Memorial Hos pital In my opinion, however the indications are few and in most cases there is a better alter native

Skin Grafts for the Repair of Superficial Facial Defects. Skin grafts find their greatest usefulness for lesions of the tip or bridge of the nose where the use of rotated flaps to fill defects following excisions would produce an unwarranted degree of cosmetic blemish Defects of the alae or lower half of the nose are particularly suitable to the application of such technics since the graft when sutured in place can be held firmly splinted by a sandwich type of dressing (Fig. 197) Full thickness grafts from the back of the ear and mastoid region can also be applied to operative defects of the cheeks The cosmetic appearance of split skin grafts applied to the face are always inferior to full thickness grafts

The upper eyelid is a ready source for full thickness grafts up to 1.5 × 2 cm. in diameter without producing any serious cosmetic or func tional defect of the eye itself Their greatest disadvantage is that the grafts are thin and their texture does not match well except for defects of the upper portions of the face near the lower eyelids or for the upper portion of the bridge of the nose For defects of the lower part of the nose or the lower part of the face *skin from the back of the ear provides a much* better match so far as color and texture are concerned.

For larger defects of the skin of the face or scalp where simple healing and epithelization are the first consideration and where the cos-metic appearance is of secondary importance full thickness grafts of sufficient size cannot be obtained from the back of the ear and eyelid, and a convenient source of fairly well matching skin is found on the upper anterior chest wall in the clavicular area, or split thickness grafts can be taken from the abdomen or thigh. The size of these larger defects can often be mark edly reduced by application of the purse-string principle

A useful maneuver in similar lesions of the bridge or lower portion of the nose is the em-ployment of a punch (Fig 148) using the same instrument both for punching out the lesion and for taking the skin graft from a site such as the back of the ear If such small grafts are immobilized by the simplest form of over lying suture and held in place with manual pressure over the gauze for 15–20 minutes and then with a simple form of pressure dressing, they will take in almost all cases and give a result superior to that of a simple closure of an *elliptical defect by suture alone*

Tubed Pedicle Grafts. For the transfer of double-lined grafts (skin on the outside and inside with a layer of soft tissue in between) a cylindrical tubed pedicle is undoubtedly the most practical The pedicle itself serves as the graft rather than simply as a vascular channel to nourish the so-called "frying pan" or "tennis racket" graft at its extremity With a sufficient length of tubed pedicle two three or more sections can be migrated to lie side by side and then fused to each other and to the edges of the defect so as to furnish tissue for any size of de-fect that is likely to occur in the areas of the mouth or pharynx (Figs 128–138) The ex pedient of burying a full thickness graft to line

the undersurface of such flaps is not a practical maneuver because when such graft is once healed into place it tends to contract to form a tube of not much greater diameter than that of the tubed pedicle itself

Tubed pedicle flaps for defects of the neck and face are best formed along a slightly oblique line along the clavicle or just above or below it. In this area subcutaneous tissues are not unduly thick. At the level of the clavicle the platysma muscle forms a deep layer which serves as a deep margin of the flap to be tubed. The intimate circulation of the skin and subcutaneous tissues in this region is excellent and little trouble will be experienced from ischemia of the tubes. If necessary the flaps from this area may be in the neighborhood of 4 × 16 cm the proportion of 4 or 5 to 1 being safe in most cases. The entire flap should be tubed (Figs 122–124) and there is little to be gained by the somewhat timid practice of tubing only central portions

Experience has shown that the necrosis of such tubes is undoubtedly caused most often by the undue thickness of the layer of underlying fat, which results in too great tension on the sutures. When it occurs such necrosis is usually preceded by the formation of blisters suggesting that a return of the venous flow is more critical than the adequacy of the arterial supply. The immediate circulation in the tube as judged by its appearance in 24 hours seems to be promoted by preoperative injection along the proposed flap of a weak solution of adrenalin to the point of visible blanching of the skin and tissues *

The tubes are best constructed along the line of the clavicle running to the shoulder. Bilateral tubes may be raised if larger quantities of tissue are required to repair the defect. Such infraclavicular tubes are in my opinion much to be preferred for facial repair to the tubes raised from the skin of the abdomen or the lateral wall of the thorax

Bone Grafts With the assistance of antibiotics many bony defects particularly those of the mandible may be repaired at the time of the original excision by autogenous bone grafts obtained from the crest of the ilium or from a rib. Rib grafts are more easily obtained and possess a natural curve which in many cases conforms well to the structure to be replaced. One disadvantage is the somewhat narrow calibre. Iliac crest grafts conform more nearly to the thickness or calibre of the mandible—the prominence of the anterior-superior spine being used to replace the angle of the mandible. In order that iliac grafts should have the proper curve they should always be taken from the same side as that of the bony defect. By careful technic and the administration of heavy doses of antibiotics there need be little fear of sepsis. The bone graft should be well covered by layered closure of the overlying soft tissues. No deep drain should be used

One of the greatest drawbacks to bone grafts is their unpredictable tendency toward resorption. While in some cases firm bony union takes place and there is no subsequent resorption whatever in others the grafted portion of the mandible begins to resorb within a few weeks after operation and after several months there may be little or no bone remaining. Infection does not seem to play any significant role in this tendency. There is no explanation as to why in one case a graft of the mandible is resorbed and in the next case it remains undisturbed

Our attempt with heterografts from bone banks have failed in practically all cases. They are either extruded or resorbed. The same is true of boiled and reinserted osseous homografts † A better solution of this problem may

* I first noted this phenomenon in a case where the tube was raised under local anesthesia in a patient who appeared to be so hypersensitive to pain that an undue amount of local anesthetic containing adrenalin was injected. Although the tube appeared at the end of the operation to be unusually white and cold, on the morning after it had a most favorable pink and warm tint. This experience led me to employ such adrenalin injections almost as a matter of routine, using saline as a vehicle when general anesthesia is employed

† Many years ago in a case of basal-cell cancer of the scalp I made a resection of the superficial lesion and a full-thickness area of underlying parietal bone which was invaded by cancer. I had the trimmed bone boiled in saline and replaced it, covering the superficial wound by a rotated flap. The wound healed without incident. Recalling the experience some years later the procedure seemed to offer some possibilities with mandible resections for invasion by cancer. During the early 1940's we attempted several cases on the Head and Neck Service at Memorial Hospital. After trimming the soft tissues from the resected segment of mandible, we boiled the bone in saline to destroy the invading tumor cells, and replaced the bone (which fitted of course, much better than any bone grafts taken from another site). In most cases the replacement seemed to be tolerated very well for a few days, or even for two weeks, but eventually the boiled bone extruded itself or had to be removed, in all cases because of local complications. We have not recently used this maneuver

be in certain forms of metal splints. The modern form may be kept sterilized and readily available without the necessity of an operative exposure to obtain a bone graft. Metal splints are readily manipulated into any form desired, and are not absorbed These advantages are so marked that it is possible that the use of bone grafts in head and neck surgery may eventually become obsolete.

Buried Metal Splints. Buried metal splints and prostheses have been employed for many years for fractures of long bones and during the past decade or more various types of supposedly nonreactive metal rods and splints (Ticonium and others) have been used In our clinic we have had considerable experience with such devices and have found that one of the main drawbacks is the hardness of the metal it cannot be handily cut to length bent or shaped at the operating table In brief some more malleable substance is needed

During recent years a form of woven mesh of stainless steel wire has been used by us with considerable success in a few cases of skull defects resulting from excision of bone because of osteogenic sarcoma This material has been used by others in the repair of ventral hernias The first to publish a report of the use of wire mesh for bone defects of the mandible were Attie Catania and Ripstein and I first observed the use of this material by Guzman-Blanco and Marquez in Caracas Experience to date indicates that this form of metal splint, of little bulk and with the interstices permitting the formation of an adequate intimate circulation within its tissue bed makes a more malleable adjustable form of splint that is tolerated by tissues better than any other previously employed Examples of its use are found in Chapter 14

Limitations in Usefulness of Bone Grafts and Metal Splints for Mandibular Defects. The professed purpose of replacement of mandibular bone defects is the preservation of the cosmetic appearance and of the function of mastication and if the procedure does not attain a fair measure of either of these purposes, then it is not only useless but meddlesome and likely to increase the complications and lengthen the morbidity

In many case reports in the literature the immediate survival of the bone graft or healing about the metal splint appears to be considered as proof of the desirability and the usefulness of this reconstructive procedure. Actually if only the posterior or two thirds of one mandible is resected there is such slight cosmetic deformity that the interposition of a graft or splint makes little difference and in these cases my associates and I at Memorial Hospital make no replacement whatsoever When the bony defect approaches the midline or beyond so that the prominence of the chin itself is lost, then at least some consideration should be given to the use of a wire mesh splint. In rare cases there may be reason to resect the whole mandible for a bone lesion not invading the soft parts In these there may be an indication to replace the whole mandible by a wire mesh splint (Figs 333–336)

It is doubtful that any bone graft or metal splint will aid appreciably in restoring the function of mastication in mandibular defects. It should be realized that normal mastication requires not only precise articulation of the teeth (or dentures) but also a highly mobile temporomandibular joint, and the concerted action of the masticatory muscles (temporal masseter internal pterygoids, external pterygoids) There can be no functioning reattachment of all these muscles to a graft or splint and no normally mobile and flexible temporomandibular joint No restoration of the grinding action of mastication is therefore possible Therefore the replacement of the whole mandible by a wire splint as in Figs. 334–336 is somewhat disappointing in its long-range benefits

In most instances of mouth cancer in which partial mandibular resection is indicated there must be an associated wide excision of soft tissues (tongue floor of mouth, etc) A shifting of soft parts to a marked degree is necessary in order to obtain primary closure As a matter of fact, one of the main indications for mandibular bone excision is to mobilize soft tissues, and it is obvious, therefore, that neither bone grafting nor metal splinting is applicable

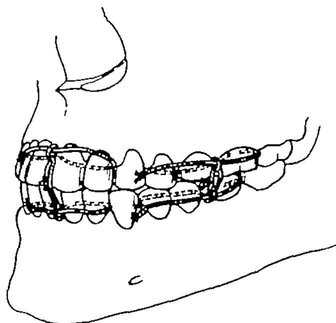
In brief it is my impression that in head and neck surgery for cancer at the present time the use of bone grafts and metal splints tends to be overstressed In many cases the replacement is of little or no value either cosmetically nor functionally and in some it is even a handicap and nuisance

Fixation of the Mandible by Bite Block or by Wiring the Teeth. Although immobilization is

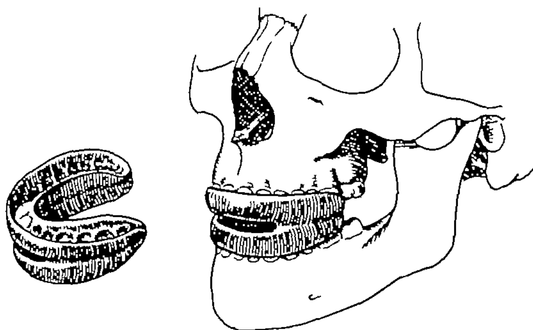
highly desirable in cases where the mandible has been temporarily sectioned and resutured and in cases of bone grafts or wire splints, such fixation is difficult if not impossible unless there are anterior teeth remaining in both the upper and lower jaws.

Using the anterior teeth, the mandible can be fairly well immobilized by looped wires after the technic long used by dentists and oral surgeons in fractures of the mandible (Fig. 63) The method has certain disadvantages however in that the teeth are brought into such close apposition as to interfere with the taking of food and drink by mouth. A previously prepared bite block (Fig 64) is in many ways preferable since it can be inserted prior to the beginning of the operation to stabilize the mandible during the operation It is less effective in edentulous patients In the postoperative period it can be worn comfortably for several weeks if necessary during which time the patient can sip liquid foods through the mouth It has also been used in our clinic as an insurance against spontaneous fracture in cases where only a thin margin of the mandible could be preserved

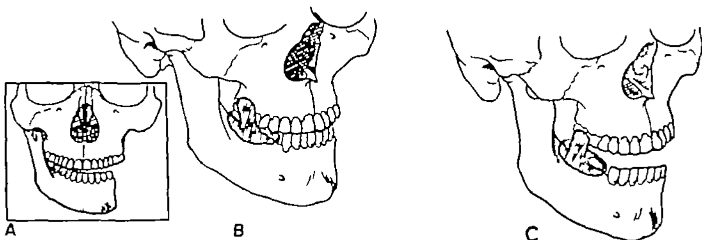
Surgical Prosthesis The most useful application of surgical prostheses following head and neck surgery is in the filling of palatal defects following surgery of the antrum and/or maxilla



63 Mobilization of the mandible by wiring the teeth. For immobilization and splinting of the mandible, an alternate method to the bite block is to apply wire loops to the teeth preoperatively so that at the end of the operation the loops on the upper and lower jaws can be joined by additional wire loops This device has long been used by dentists and oral surgeons in fractures of the mandible.



64 Bite block to stabilize the mandible. Whenever for any reason the mandible has been weakened (fracture splint or graft marginal resection) a previously prepared bite block will eliminate the risk of postoperative fracture and displacement of the mandibular fragment.



65 Flange splint to prevent collapse of mandibular fragment Without some form of splint the remaining portion of a partially excised mandible tends to collapse to the opposite side *A* The flange splint shown in *B* and *C* will hold the mandibular fragment in a fairly normal occlusal position.

In most of these cases the wide-open operative defect has been covered by a skin graft held in place by suture and by packing (Fig. 452) Such packing is usually left in place about six days at which time the skin graft has either be come firmly attached or obiously will never do so At this time when the pressure dressing is removed the disability of the palatal defect first becomes evident

A well-organized Head and Neck Service should include a Dental Department a member of whose staff should take an impression of the palatal defect as soon as the pressure dressing is removed A temporary prosthesis enabling the patient to eat and drink by mouth and to relieve the speech disability can be finished within 24 hours Subsequent adjustments may be neces sary through the healing period and after a couple of months when healing and firm con tracture has taken place a permanent remov able prosthesis may be made

Another practicable form of surgical prosthesis is an Ackerman flange to prevent collapse of the remaining mandible when a portion of the opposite side has been removed An impression for such a prosthesis can be taken and completed within a day or two after the operation (Fig 65)

Ackerman has devised several forms of hinged prostheses for lessening the disability and deformity following partial resection of the mandible Although such devices occasionally are partially successful they are nevertheless, highly expensive in time effort and cost, and are not practicable in the large percentage of cases

WOUND DRAINAGE

After radical block dissection of the neck where the operative exposure has been wide and the cervical lymphatics have been transected the copious outpouring of serum lymph and sometimes even chyle into the wound necessi tates adequate drainage When neck dissection is combined with resection of a primary lesion in the mouth the whole wound is contaminated by mouth and pharyngeal secretions In all neck dissections both simple and combined a soft rubber (Penrose tubing) drain should be loosely stitched to the posterior belly of the digastric muscle (or held by a mattress suture to the skin flap) and brought out preferably through the anterior lower arm of the wound with a 2 5 to 3 cm aperture between the skin edges at this point (Fig. 86) By the fourth day the drainage tract will be well established and the drain itself should be completely withdrawn After opera tions on the parotid where some fragments of salivary gland remain the wound should be drained for at least twenty-four hours

In total laryngectomy where primary union is the aim there nevertheless will be sizable pockets or "dead" spaces in the wound in both lateral aspects of the neck. Since the first consid

eration in these cases is firm primary closure of the pharyngeal suture line these lateral dead spaces had best be drained through wide stab wounds and rigid rubber tubes inserted which permit irrigation and drainage of the tissue pockets for the first four to five days (Fig 86)

No drains should be employed in simple thyroidectomy (without neck dissection) The wound should be tightly closed in layers by suturing the pretracheal muscles and the skin and subcutaneous tissues If a drain were to be used it would, of necessity have to be inserted in an aperture through the pretracheal muscles and an attachment of the scar to the trachea will almost invariably follow Such a scar will move upward with the trachea and the larynx on swallowing—a sequela both unsightly and objectionable to the average patient

As previously stated bone grafts or metal splints should be covered by a layered closure of the soft parts and/or mucous membrane and skin *without drainage* If the operative wound enters the mouth the end of the graft or splint will be unavoidably contaminated nevertheless *drains should be placed to the site of bone grafts* otherwise, persistent serous seepage is likely followed by a high incidence of subsequent wound infection

Sump Suction Drainage In hospitals where continuous suction at the bedside is available the placement of a sump suction catheter through the lower posterior arm of the neck dissection wound will prove highly beneficial (Fig 86) It is probable that the principle could be used even though the negative pressure has to be applied by a bedside suction pump and applied intermittently The sump suction catheter has previously been used by others for the drainage of empyema and for pelvic abscesses The double catheter eliminates the tendency to blockage of the tube by the negative pressure The amount of serum which collects in the bottle during the first 24 hours varies considerably, depending upon the degree of hemostasis at the end of the operation It is a common observation that in some patients the clotting mechanism is so efficient, that at the end of the operation there will be little or no oozing ("dry wound) while in other patients with even a moderate degree of bleeding tendency there will be generalized oozing despite the most meticulous attempt at hemostasis Such a variation in bleeding tendency has been illustrated in our experience by the fact that although with the same surgeon using the same standard for hemostasis it is found that in one patient only 60 to 75 cc of blood or serum will collect in the bottle in 24 hours, and that at the other extreme in spite of the best efforts at hemostasis, there will collect as much as 500 cc of blood and serum (even with the application of a pressure dressing) in 24 hours The average drainage during the first 24 hours appears to be 250 to 300 cc In the average case about 250 cc collects during the first postoperative night the next day the volume decreases by about 50 per cent and the third day so little has collected that the suction catheter can be removed entirely leaving a Penrose drain in place for an other 48 hours With sump suction drainage the dressing is relatively dry or at least is never saturated with blood and serum as is sometimes the case when bulky gauze dressings are applied

We have used several forms of double tubes for sump suction drainage The Lloyd catheter is fairly satisfactory although it seems to us to be a little bulky A convenient expedient is the use of two #18 or #20 French urethral catheters with additional holes near the ends and tied together (Fig. 86) One catheter permits the entry of air the other is attached to the system of negative pressure with a bottle for the collection of the discharges

ESSENTIAL AND PROPHYLACTIC TRACHEOSTOMY

This procedure is an essential precaution at the close of the operation in any of the following situations either partial or complete resection of the mandible or when the mandible is temporarily sectioned and resutured the second stage of bilateral neck dissection or bilateral neck dissection in one stage one-sided neck dissection following heavy radiation therapy partial laryngectomy and anterior pharyngotomy

It may also be judicious to perform prophylactic tracheostomy in some cases of partial glossectomy and radical resection of the maxilla involving the use of skin grafts and bulky dressings On the other hand, prophylactic tracheostomy is less essential than *might* be suspected in

thyroid operations, even in total thyroidectomy but may be advisable in certain cases of hemi thyroidectomy combined with neck dissection If there is any doubt in the surgeon s mind he should proceed on the basis that it is much better to use prophylactic tracheostomy too often than too seldom If in a given case there appears to be no obstruction to the normal air way the tracheostomy tube may be corked immediately after the patient s return to bed and removed the day after the operation.

In the first few days following operation some aged patients especially those of less robust constitution may be unequal to a physical effort of coughing sufficient to raise the bronchial se cretions In these cases a tracheostomy affords an opportunity for removal of such bronchial secretions by the frequent insertion of a suction catheter into the trachea and bronchi—a ma neuver often followed by marked relief and clinical improvement In some cases the tube may be left in for several days for this purpose alone remaining corked except when the tra chea and bronchi are being suctioned.

The technic of tracheostomy in the uncompli cated case of a patient with a thin neck is shown diagrammaticaly in Figs 103 to 109 On the other hand, the head and neck surgeon will find that in most cases the surgical anatomy of a tracheostomy is not quite so simple and in any event it is so varied as to preclude any descrip- tion by illustration

In emergency tracheostomy speed is essential and often the establishment of an airway must be effected within a matter of minutes Diffi culty arises in patients with short fat necks especially when a bulky tumor of the thyroid or other soft parts, or an area of heavily irradiated indurated infiltrating cancer is superimposed upon the trachea in the lower anterior neck In such instances the trachea may lie at a depth of 5 to 6 cm and may be pushed several centi meters to one side In some cases it may be fairly plain as to which side the trachea has been pushed but the extent of the displacement will remain uncertain until the structure is actually located Existing dyspnea is always increased by placing the patient recumbent on the table and by beginning the manipulations on the neck In some of the more urgent cases it may be essen tial to perform the operation with the patient in a semi-sitting position Local anesthesia must obviously be used or none at all in a dire emer gency

The incision should be kept low—just above the suprasternal notch Its length must depend upon the degree of emergency In an elective case it should be short—sometimes no more than 15 mm in length In an emergency it may be several centimeters One of the obstacles to the rapid and successful completion of the tracheostomy is bleeding from the inferior thy roid veins which descend from the isthmus along the trachea near the midline If a vein is cut into or punctured, the wound will be imme- diately filled with blood often preventing further progress until the oozing is controlled

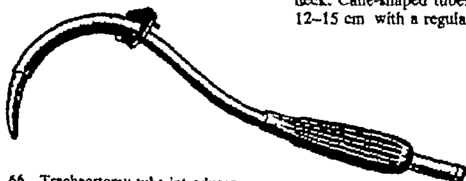
In difficult cases, where the trachea lies at an unknown depth and to one or the other side the manipulations must be mainly by palpation using a dissecting scissors for a combination of sharp and blunt dissection The exploration is carried successively deeper until the trachea can be palpated by the finger As soon as the tracheal rings can be identified an incision should be made the opening grasped with a tracheal hook and the tube inserted A useful form of instrument for any tracheostomy and one which is almost indispensable in the more difficult cases is the *tracheostomy tube inserter* shown in Figs 66 109 to 110 This instrument can be used to carry out difficult tracheostomies almost entirely by palpation in the deeper por tions of the wound and then to insert the tube itself

One of the most frustrating experiences of the head and neck surgeon is an attempt to re- lieve a tracheal obstruction situated low down just above the carina especially when compli cated by the presence of a bulky tumor in the anterior neck In these cases a breathing tube longer than the standard tracheostomy tube, is required (Fig 67) The expedient of a cane- shaped tracheostomy tube has been tried but is not successful for the reason that there is no way of providing a full-length inner cannula that can be removed for cleansing and reinsertion Such a full-length inner tube requires that both the inner and outer cannulas be of equal length and form perfect and identical arcs. Without a full-length inner breathing tube no tracheostomy can long function for the outer tube would soon fill with blood crusts and secretions and become obstructed From the practical standpoint the

MODIFICATIONS OF TRACHEOSTOMY EQUIPMENT

66 The inserter consists of a curved, bluntly pointed hollow obturator whose tip has numerous perfora tions so that when threaded through a tracheostomy tube and the whole inserted through a slit in the trachea, its presence within the tracheal lumen can be detected immediately by an exchange of air The inserter is then withdrawn, leaving the tracheostomy tube in place

67 The standard tracheostomy tube, approximately 7–8 cm in length, may not be long enough when the respiratory obstruction is in the trachea itself or when there is a bulky overlying tumor in the lower neck. Cane-shaped tubes are impractical and a tube 12–15 cm with a regular arc is required.



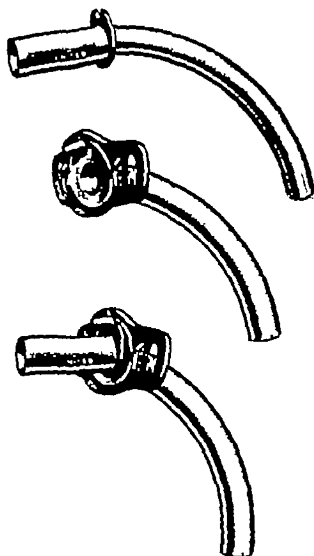
66 Tracheostomy tube introducer



67 Extra-long tracheostomy tube for low respiratory obstruction.

MODIFICATIONS OF TRACHEOSTOMY EQUIPMENT

An extension on the inner cannula of the stand-rd tracheostomy tube permits an unobstructed air ... even though a fairly bulky dressing must be ap-lied to the neck.

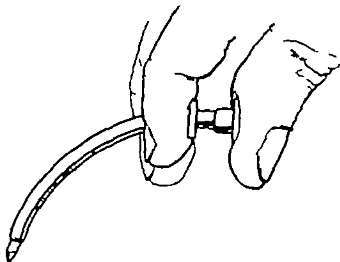


48 The standard #6 tracheostomy tube with an extension.

tracheostomy tube should be considered to consist of a main part—the inner tube through which the patient breathes—while the outer cannula is simply a permanent tract within which the inner tube lies and through which it can be reinserted.*

TRACHEOSTOMY TROCAR FOR ACUTE RESPIRATORY OBSTRUCTION

On any busy head and neck surgical service (even in office practice) there will occasionally occur cases of laryngeal spasm and acute respiratory obstruction incidental to the manipulations of direct laryngoscopy for biopsy or during intubation for Pentathol anesthesia The emergency is sometimes so acute and critical that even in an operating room with average facilities, a fatal degree of asphyxia may develop before a tracheostomy can be made with the regular cannula In such instances the tracheal trocar (Fig. 69) devised by one of my associates Dr Oliver S Moore may be instrumental in saving life For its insertion the most accessible or superficial level of the trachea is selected by palpation and an incision made from 2 to 2.5 cm in length, and carried down in the subcutaneous tissues to a sufficient depth so that the cartilaginous rings of the trachea can be identified As soon as the position of the trachea is established the instrument is pushed through into the tracheal lumen and the obturator withdrawn While the calibre of the cannula (4–5 mm) is hardly adequate for normal respiration it serves to permit sufficient exchange of air to resuscitate the patient and preserve life As soon as the emergency is relieved the wound is widened, the trachea incised and a standard tracheostomy cannula inserted



69 The Moore emergency tracheostomy trocar While the breathing cannula in this instrument has an internal diameter of only 4 mm it is nevertheless sufficient to relieve an acute emergency and to sustain life until the incision can be widened so as to insert a standard #6 tube. Ordinarily a short incision sufficient to admit the exploring finger is made in the skin and the trocar forced through into the lumen of the trachea.

* The size (calibre and length) shape, and over-all construction of the standard tracheostomy tubes as used in America (Pilling and others) are somewhat traditional, the most common variety being almost identical with that found illustrated in MacKenzie's book *published in 1880* The commonly used #6 tracheostomy tube has 7 to 8 millimeters as its internal diameter (the inner cannula) and the outside curve of the outer tube a length of about 9 centimeters. Larger *and smaller caliber* tubes are numbered somewhat arbitrarily from 1 to 12, without direct reference to their caliber in millimeters. For emergency tracheostomies in adults it has become traditional to employ the standard #6 cannula, *and there is* some disadvantage in that it is often assumed that this caliber is suitable to all adults regardless of size or weight. As a matter of fact, the standard #6 tube is suitable only for the average adult *of 150 pounds* or less. This caliber (7 to 8 millimeters for the inner cannula) is not adequate for persons much over 150 pounds, especially during periods of physical effort when a larger volume of respired air is required On the other hand, in women of slight build, and in children, the caliber of a #6 tube may be too great, i.e., it may fill the entire trachea so as to occlude all respiration through the larynx. With children particularly a graded set of tracheostomy tubes, down to the very smallest, should be on hand.

In certain cases the standard average 9 cm. length of the #6 tube may be so long as to impinge on the tracheal wall especially in thin persons. On the other hand in cases of tracheal compression by thyroid tumors a 9 cm length may be entirely *too short*.

After laryngectomy the trachea descends in a straight line from the tracheal stoma, and a tracheal cannula with a flatter curve and a face plate at a more acute angle may be required than that found in the standard #6 After laryngectomy the stoma should admit what in our clinic has been arbitrarily classified as a #10–12 *laryngectomy tube* and for us an instrument manufacturer has supplied tubes of various lengths, curves, calibers, etc., to meet a variety of needs. In all clinics where head and neck surgery is performed extensively provision should be made to have on hand a fairly wide range of sizes and shapes of breathing cannulas to meet all possible needs.

PROPHYLACTIC ARTERIAL LIGATIONS

At about the turn of the century the practice in head and neck surgery of prophylactic ligations of arteries of the neck to reduce hemorrhage became popular In the absence of modern methods for the control of infection and because of the practice of leaving wounds of the mouth wide open to heal by secondary intention slough and postoperative hemorrhage were common fatal complications and ligation of the external carotid or at least lingual arteries was a reasonable precaution and for the time served an excellent purpose

The same was also true to some degree during the 1920 s and 1930 s when the most popular therapy for cancer of the mouth was irradiation—especially by interstitial radium (seeds or needles) and the use of cautery The author can well remember the practice at Memorial Hospital at that time, when ligation of an external carotid artery as a prophylactic against hemorrhage in localized radiation necrosis of the mouth was one of the most commonly performed single operation on the Head and Neck Service

In more recent times less dependence has been placed upon necrotizing doses of radium for the control of mouth cancer and therefore radionecrosis is a much less frequent complication, and the need for such prophylactic arterial ligation has diminished In addition, the use of cautery in the mouth with the wound left wide open has given way to clean scalpel excision and primary closure, while the availability of blood banks has reduced the serious consequence of moderate hemorrhage Fifteen years ago the prophylactic ligation of the external carotid was routine before the resection of the maxilla this has been replaced in our clinic by the practice of more rapid operating and blood transfusion, so that such ligations are no longer part of the regular routine

The ligation of an external carotid artery is not a difficult procedure but one of its greatest objections is the subsequent scarring in the neck at the level of the subdigastric nodes which may make difficult the later prompt discovery of metastases and act as a serious handicap to adequate neck dissection should they be found.*

Some surgeons hold that the scarring incident to prophylactic external carotid ligation does not interfere seriously with subsequent neck dissection, but I have the feeling that an experienced surgeon with a high ideal of an adequate neck dissection can not reasonably hold such an opinion.

Ligation of the external carotid artery should be a routine procedure at the completion of neck dissection before entering the mouth to resect the primary lesion It is also prudent to ligate the vessel at the end of all neck dissections for cancer in which there is a possibility of recurrence from the local site should the disease become uncontrollable There are no hazards or untoward sequelae from the ligation of one or both of the external carotid arteries at the same operation

SURGERY AFTER RADIATION THERAPY

Twenty five to thirty years ago certain cases of cancer were classified as secondary operable" (as distinguished from "primary operable") In this "secondary" category it was postulated that a tumor and or its metastases became operable" only after receiving radiation therapy which supposedly rendered the tumor more "movable" or devitalized such tumor emboli as might be dislodged during the operation so that they would not "take" at the site to which they might migrate or metastasize Such doctrines have been much less often advanced in recent years

After the maximum justifiable tolerance dose of radiation therapy cancer will often persist even at the center of the most heavily treated portion of the irradiated volume Persistence of cancer is also often the result of sublethal dosage or ill-conceived and poorly administered treatment. In other cases the failure of radia

* One important and highly practical exception to this rule is found in cases of extensive (usually recurrent) basal-cell carcinoma (including the adenoid variety) of the skin of the nose deeply invading the nasal cavities and sometimes the maxillary antra A necessarily deep and wide excision of the midportion of the face (Fig. 192) is associated with such profuse bleeding as to seriously obscure the operative field. Preliminary bilateral external carotid ligation so reduces the hemorrhage as to permit more accurate and adequate margins at the borders of the excision. Since metastasis from basal-cell carcinoma is not to be expected, the above-mentioned objections, for that reason, do not apply in this particular tumor

tion may have been partly anticipated but given, nevertheless as a preliminary trial or to "slow down" the rate of progress of the disease What ever the cause of radiation failure its consequences are the same—the growth has been permitted to advance during the wasted time and depending on the intensity of the radiation effect, has made the prospects offered by sur gery less favorable

The statement is often made (usually by radiologists—never by surgeons of broad expe rience) that radiation therapy does not interfere with subsequent surgery This assertion is simply not true While a dose of a few hundred roentgens through a moderate-sized portal may result in no appreciable disadvantage except the loss of time the administration of a much heavier dose will always compromise healing. The fact that after unsuccessful radiation therapy total laryngectomy can often be suc cessfully accomplished in some cases with prompt healing does not prove that in the aver age case this operation or any other can be equally successful after radiation from the standpoint of either immediate healing or ultimate cure Furthermore in most cases of radia tion failure the cancer has been allowed to extend locally with the additional risk that metastases have been permitted to take place

The conscientious surgeon may just as well resign himself to accept the fact that for the foreseeable future he will be repeatedly called upon in cases of radiation failure in which the supposedly conservative radiation has been "given a trial" If he succeeds the referring radiologist will conclude that the previous radiation therapy did no harm If surgery fails the failure will be unfairly considered by many as another case proving that surgery also has its limitations. Despite these drawbacks and discouragements the surgeon must in all con science take over such radiation failures, some of which may also be his own Total laryn gectomy combined with neck dissection often succeeds following radiation failures but slow healing, an abnormally high incidence of fistulas and persistent lymphedema are to be expected *

Partial laryngectomy may appear to be a logical procedure after radiation failure of small (less than 1 cm) growths of the vocal cord However in such cases the postoperative state is associated with marked and persistent edema of the arytenoids usually severe enough to block any return of phonation and sometimes resulting in a moderate dyspnea The subsequent course and the follow up is rendered difficult for both the patient and the surgeon since the edema may make it impossible to rule out a recurrence by obstructing an adequate view of the glottis Radiation therapy is often proposed as a trial in small growths of the larynx for the alleged reason that if successful it is more conservative and if the attempt is

* The following case report is that of successful surgery after radiation failure, and exemplifies the difficulties, complications, and protracted morbidity which could have been avoided had surgery been used in the beginning

B.L., aged 49 had complained of symptoms referable to his throat in December 1951 and a diagnosis of epidermoid carcinoma of the larynx was made on a biopsy from the right aryepiglottic fold After consultations with several surgeons and radiotherapists it was the consensus that x-ray therapy would be the most "conservative" treatment and, according to the history from January to March, 1952, he was given a "calculated tumor dose" of 6500 r at 250 kv over a period of 50 days. The symptoms continued, and he was finally re ferred for a consultation and surgical treatment eight months later

At the time of the first examination after referral in October 1952, it was obvious that there was persistent disease in the markedly edematous larynx and that there were now bilateral cervical metastases. The skin and subcutaneous tissues of the neck showed marked radiation sclerosis. Although the outlook was admittedly poor radical surgery was offered as the only resort, and accordingly a simultaneous bilateral neck dissection and total laryngectomy were performed at Memorial Hospital on October 22, 1952. Histologic examination of the surgical specimen revealed active cancer to be present in the larynx and in lymph nodes on both sides of the neck, despite the earlier "tumor dose of 6500 r"

The postoperative course was associated with a number of complications including lymphedema of the face and tongue to a grotesque degree which persisted for several months. The healing was greatly delayed and on the right resulted in a persistent salivary fistula which required several plastic operations over a period of a year to obtain closure. Although in this case postradiation surgery has resulted in a four year control of the disease to this date, a hospital stay of several months was required and the physical disability prevented his re turn to his regular activities as a business executive for over two years. This case epitomizes the difficulties of postradiation surgery and serves as an example to disprove the frequently heard claim that it is justifiable to attempt radiation first in cancer of the larynx. The report also supports our contention that total laryngectomy is rendered a great deal more difficult by previous radiation therapy

unsuccessful surgery can always be done As a matter of fact, a small growth—for which partial laryngectomy through laryngofissure would have been adequate—when unsuccessfully treated by radiation will almost always extend so that total rather than partial laryngectomy is required It might be more logically argued, therefore that radiation therapy is a radical rather than a conservative procedure

In radionecrotic persistent mouth cancer there will be a high percentage of protracted postoperative morbidity from failure of wound healing. In persistent heavily irradiated cancer of the skin the radiation fibrosis and inelasticity of surrounding skin makes closure difficult, the irradiated wound area does not favor the 'take' of skin graft, and disfiguring lymphedema detracts from the cosmetic result

Chapter 4

POSTOPERATIVE CARE

Care following head and neck surgery is concerned with a set of hazards somewhat different from those following major surgery of other portions of the body such as the abdomen or thorax After surgery of the head and neck the functions most likely to be interfered with are swallowing and respiration—this because the surgical manipulations or the dressings are likely to produce respiratory obstruction and/or dysphagia whereas the function of respiration by the lungs themselves or the function of digestion by the stomach and lower intestinal tract are usually normal once the inspired air and ingesta respectively have passed through the postoperative bottleneck in the mouth or pharynx.

Even after the most extensive operations on the head and neck there is little or no disturbance of the electrolyte and fluid balance, little or no vomiting or anorexia, and a normal intake can usually be achieved within 24 hours by naso-esophageal feeding catheter The postoperative care following head and neck surgery is therefore mainly that of maintaining an adequate airway, the immediate intake of food and fluids by naso-esophageal catheter the full use of antibiotics, pressure dressings to prevent collection of wound discharges beneath the skin flaps, and care of the local wound

RECOVERY FROM ANESTHESIA—MANAGEMENT OF ENDOTRACHEAL BREATHING TUBE

At the completion of major head and neck surgery under intravenous general anesthesia the patient invariably returns to the ward or Recovery Room with either a nasotracheal breathing tube or tracheostomy Strict orders should be given to the nursing staff that the nasotracheal breathing tube must remain in place until the patient has recovered consciousness sufficiently to object to its presence If the breathing tube is removed while the patient is unconscious laryngeal spasm may ensue and result in fatal respiratory obstruction Since the presence of the tube within the glottis always tends to produce some trauma, it should be withdrawn promptly when the patient has recovered consciousness Even after the longest head and neck operation—occasionally lasting six to eight hours—the patient usually regains consciousness within one hour If at the completion of the operation a tracheostomy tube is left in place care should be taken that the opening is unimpeded and that suction by means of a catheter is made in the trachea and bronchi, whenever gurgling indicates an accumulation of secretions

IMMEDIATE PRESSURE DRESSINGS

Most surgical wounds of the superficial tissues about the body benefit to some degree from firm pressure of dressings, which tends to reduce the accumulation of blood and serum in the wound spaces, and to lessen passive congestion in the overlying flaps. This is particu-

larly true following neck dissection The soft tissues of the neck overlie firm body structures (cervical spine, bones of the face, skull etc.) and therefore efficient controlled pressure over the wound can be applied in most cases Loosely applied dressings over the wounds in neck dissection will almost invariably result in complications, beginning with the accumulation of blood clot and serum in the loose space be neath the mobilized flaps with edema from passive congestion in the flaps themselves. Such complications can be prevented or at least markedly reduced by the application of firm pressure in the overlying dressings (Fig. 70) It has long been the practice in our clinic to build up such bulky dressings by the use of mechan ic s waste and combination pads (Dakin s pads) materials which are much cheaper than fluffed sponges alone Elastic adhesive tape (Elastoplast) is a useful adjunct in bulky dress ings In cases where adhesive tape must be applied daily irritation of the skin can be re duced by the application of compound tincture of benzoin allowing a few minutes to elapse before re applying the adhesive

Air Cushion Pressure Dressings. One of the disadvantages of any form of supposedly elastic pressure dressing is that no matter how care fully and firmly applied the elastic pressure tends to diminish or disappear completely after a few hours. If attempts are made to overcome this loss of pressure by making the bandage tighter the patient complains bitterly about the rigid constriction about the neck In recent months we have incorporated the rubber bag from a blood pressure apparatus within the first dressing applied in the operating room The average blood pressure bag is an ideal size to cover one side of the average sized neck When the dressing is finally completed, air is pumped into the bag until the pressure of about 25 to 30 mm of mercury is produced and the con necting tube clamped (Fig 71) After a little experience the proper amount of pressure can be judged by palpation alone but it is useful for the nurse to use an aneroid or mercury monometer to test the pressure should there be any question about leakage of air This maneuver has proved most comfortable to the patient and more efficient than the simple gauze pack ing with a tight bandage The bag is replaced in the dressing at each change and re inflated On the third or fourth day when the flaps have become adherent, the use of the bag is discontinued. Sump suction drainage is also used in combination with the air pressure dressing.

The same system is useful also in parotid operations, where unless firm pressure is applied for the first 48 hours, there is a tendency toward collection of serum or blood clot within the wound, and a lengthened postoperative mor bidity

When a tracheostomy has been made at the close of an extensive operation on the neck the application of such pressure dressings requires the use of an extension of the inner cannula (see Fig 68) to prevent obstruction to the air way by the dressings themselves.

Pressure Dressings over Skin Grafts and Rotated Pedicle Flaps. On raw surfaces covered by healthy reasonably dry granulations, where the surface exudes only a small quantity of serum split skin grafts may be applied without pressure and protected only by the bird-cage type of dressing. Such an ideal surface for skin grafting may occasionally be achieved in fresh wounds but in general any wound surface will continue to ooze so that skin grafts will tend to "float off" For this reason the degree of suc cess attained in most skin grafts depends upon the application of a pressure dressing that both immobilizes and holds the graft in apposition to the raw surface so that fluid cannot accumulate beneath it The high percentage of perfect "takes" in split skin grafting of scalp defects exemplifies the significance of firm elastic pressure and complete immobilization. Various substances may be employed to obtain elastic pressure such as sea sponge which has the advan tage of considerable elasticity but is less easy to shape to an irregular surface A better com promise may be found in fluffed gauze or me chanic s waste which though not so elastic tends to conform to an irregular surface The amount of pressure to apply is a matter for individual judgment but it should probably be about 25–30 mm Hg. In pinch grafting or "postage stamp" grafting it is usually beneficial to apply very firm pressure (exceeding that of blood pressure) manually for several minutes so as to promote blood clotting and adhesion of the graft before putting on the bird-cage cover ing

The early establishment of adequate normal circulation in most pedicle flap grafts is promoted by the application of some elastic pres





70 Pressure dressing for head and neck surgery Following any extensive operation on the neck, such as neck dissection either alone or combined with removal of a tumor within the mouth, pharynx or larynx, a bulky dressing should be applied to give an even, firm elastic pressure over the skin flaps and also to absorb wound discharges. A rubber bag from the cuff of a blood pressure machine may be incorporated with the dressing and inflated to about 30 mm of mercury to provide adequate elastic pressure.



71 Air-pressure dressing in head and neck surgery The rubber bag from a blood pressure cuff may be incorporated in a neck dressing and pumped with air to about 30 mm. of mercury The device is of particular value when combined with sump-suction drainage.

sure in the postoperative dressing. The failure of circulation in all forms of pedicle or tube grafts is more frequently due to congestion from failure of venous return than from actual anemia. In all cases it is useful to relieve the flap or tube of passive congestion by gentle pressure and massage before applying the dressing.

EARLY AMBULATION

One of the most effective measures for reduction of systemic complications after all surgical procedures is early ambulation In some forms of surgery it may be difficult or even impossible to get the patient out of bed because of surgical shock or for other reasons, but such difficulties do not often apply after surgery of the head and neck. With the full replacement of any blood loss there is ordinarily little if any surgical shock and it is seldom that any patient cannot get out of bed the morning after surgery at least in a wheelchair to go to the dressing room for a change of his dressing and other local hygienic care Early ambulation is important at all ages, especially in the older age group where even mild pulmonary complications and venous thrombosis may be of significance. It is probable that the change from the recumbent to the erect position is as beneficial as muscular activity

PREVENTION AND CONTROL OF POSTOPERATIVE SEPSIS

Antibiotics. If given in adequate dosage, antibiotics will almost completely eliminate the danger of wound infection following surgery about the head and neck even though the wounds themselves will inevitably be contaminated when the incision enters the mouth Medication may be begun preoperatively but a massive dose (such as one million units of penicillin or its equivalent in other antibiotics) should be administered routinely upon completion of the operation. Admittedly such massive doses may be more than necessary but except in patients with specific sensitivity there is no objection to their use Following this initial dose, the regular therapeutic maintenance doses are given every four to twelve hours, depending upon the institutional policy Should there be any unusual sensitivity or intolerance to a particular antibiotic, or should the bacterial flora so indicate, one of the other antibiotics may be used

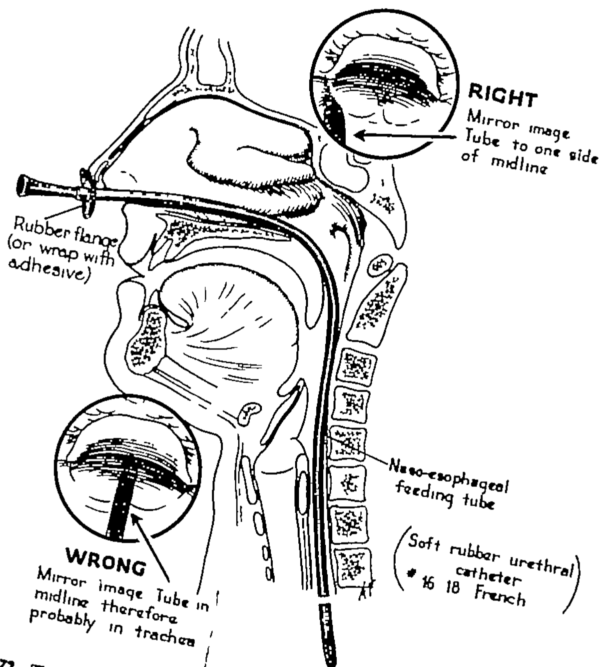
Zinc Peroxide Wound infections within the mouth are largely saprophytic in nature, as evidenced by their characteristically offensive odor Most saprophytic organisms are anaerobic and are more effectively eradicated by oxygenic preparations than by antibiotics Activated medicinal zinc peroxide is the best oxygenic product yet devised for local care of wounds in the oral cavity (Meleney) Applied locally in the form of a thin paste on gauze packs it gives off nascent oxygen for several hours after its application—in complete contrast to the immediate and short action of hydrogen peroxide All operative wounds within the mouth or connected with it should have the benefit of such applications The packs should be changed several times daily and continued for the first week or two or as long as the local infection continues

Bacillus Pyocyaneus Infections. The characteristic bluish-green pus with its sickeningly sweet odor is a well known sometimes almost epidemic springtime complication in moist wounds of the skin, especially those of the face neck or maxilla The organism is not sensitive to any antibiotic so far discovered It is particularly troublesome in large skin grafts of maxillary defects where in order to maintain immobility of the graft packing and pressure dressing should be left in place for several days. If the "green bug" becomes well established, the viability of the skin graft is seriously compromised, and when first noticed it is best to begin immediately with the power spray to saturate the dressings with a 1 per cent solution of acetic acid and to apply the acetic acid packs directly to the wound In many of these cases there also will be saprophytic infection and the acid packs every half-hour and zinc peroxide packs every three hours in continuous rotation may be beneficial

CARE OF THE TRACHEOSTOMY

When tracheostomy has been performed for prophylactic reasons at the close of an extensive operation, the tube itself may be corked as soon as the patient awakes, if careful watch

THE NASO ESOPHAGEAL FEEDING TUBE



72 The naso-esophageal feeding tube. The feeding tube is a #16–18 French urethral catheter inserted blindly. After its insertion, the correct position of the tube should be checked visually by the use of a throat mirror to insure that it enters the pyriform sinus (lateral) rather than through the glottis (midline). In the conscious patient, the correct position of the tube may be checked by injecting a few drops of Dakin's solution, which will cause violent though harmless coughing if inadvertently the tube should have passed through the glottis. The patient is soon able to state whether the tube is correctly placed.

is maintained to see that respiration is adequate Corking the tracheostomy tube improves the patient's morale, permits him to clear not only the bronchial tree but also the larynx and pharynx of accumulated secretions and further, constitutes a therapeutic test to see how soon the tube can be safely removed It is usually best to leave the tube uncorked most of the time during the first postoperative night. If on the morning following the operation the patient has experienced no difficulty with breathing, the tube should be left corked most of the time, and if his cough reflex and expulsive effort is strong enough the tube should be removed In some older people it may be prudent to leave the corked tracheostomy tube in place for several days or longer so that the bronchial tree can be suctioned regularly to clear out accumulated secretions

In partial laryngectomy the tube should likewise be corked as soon as the patient regains consciousness and if on the day following operation, mirror examination of the larynx reveals adequate air space at the glottis, the tube should be removed permanently If there is any question of an adequate airway it should obviously be left in place for a longer period.

In total laryngectomy the tube should be removed the day following operation and if the stoma is adequately wide healing is promoted by leaving the tube out, except at night when the patient may sleep more comfortably until he becomes accustomed to his altered physiology

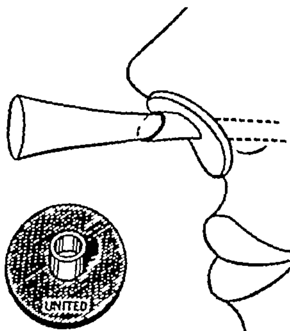
When a tracheostomy tube is left in place, suction should be available at the bedside so that the accumulated secretions can be removed if the patient is unable to expel them by himself The inner cannula should be removed frequently and cleaned with a wire brush so as to prevent clogging by dried secretions.

A permanent or semipermanent tracheostomy tube should not be changed until the tract has become definitely established—after about four or five days Beginning at about this time the outer tube should be removed, cleaned, and replaced daily

NUTRITIONAL CARE

Many patients with painful lesions of mouth or pharynx who require radical surgery of the head and neck will be admitted in a poor state of nutrition owing both to the difficulties in masticating or swallowing and to the anorexia of sepsis In other cases poor dietary habits and food prejudices may have played an etiologic role in the origin of the cancer To aggravate an already poor nutritional state, radical surgery of the mouth or pharynx always interferes mechanically with normal ingestion of food and the temporary loss of taste and appetite will further complicate the feeding problem For these reasons the successful recovery of patients from radical surgery in this area necessitates careful attention to nutrition

The mechanical difficulties of feeding are satisfactorily overcome by the routine insertion of a naso-esophageal catheter in any case where there is the slightest disability or disinclination to swallow foods and liquids So far as I am concerned no device superior to the urethral catheter (#16 French whistletip) has been found A surgeon should be responsible for the first insertion of the feeding catheter and the properly trained nursing staff should be able to carry on subsequently (Fig. 72) The tube



72 Rubber flange to prevent dislodgment and swallowing of a naso-esophageal feeding catheter Naso-esophageal feeding tubes have an annoying tendency for inadvertently slipping in and being swallowed even though supposedly fastened with adhesive tape and a safety pin A special rubber flange completely eliminates this risk

may be either left in semipermanently, or inserted only at the time of feeding, depending upon the reaction of the patient. Eventually many patients prefer to insert the tube themselves. A useful attachment for the nasal feeding catheter is the rubber flange illustrated in Fig. 73 This device prevents the inadvertent swallowing of the tube and facilitates its attachment to the anterior naris

Liquid Diets for Naso-esophageal Tube Feeding The diet must be liquid enough to pass through the tube by gravity assisted by moderate bulb syringe propulsion The liquid formula should be adequately balanced in its various food components (including supplementary vitamins), since most patients in a state of malnutrition will also have vitamin deficiencies Strictly chemical diets are to be avoided, and the liquids and purees should consist if possible, of food normally taken by the patient, who often prefers to participate in the selection of his diet An electric food blender is almost essential in the preparation of adequate liquid diets By the use of this device almost any meat, fruit or vegetable may be reduced to a puree or to a form sufficiently liquid to pass readily through the tube The standard liquid diets suitable for preparation by a food blender as used on the Head and Neck Service at Memorial Hospital are given in the table

MEMORIAL HOSPITAL LIQUID DIET FOR NASAL TUBE FEEDINGS

WARING BLENDED NASAL FORMULA—3300 CALORIES

TOTAL QUANTITY 2160 cc or 2 quarts.

FEEDINGS. 360 cc. of formula taken in 6 feedings 8 00 10 00 and 12 00 A.M. 3 00 6 00 and 9 00 P M

MIXING SCHEDULE. Best results are obtained by making up 2 feedings at a time, 3 times a day

ROUTINE PREPARATION Put the following ingredients into the blender small quantities at a time mix everything together and strain

8 00 A.M and 10 00 A.M feedings (720 cc)

- 1 cup orange juice
- 1 cup any hot or cold cereal
- 2 raw or cooked eggs
- 1 slice white bread
- 1 teaspoon butter
- ¼ teaspoon salt
- 1½ cups milk or enough to make up 720 cc.

12 00 noon and 3 00 P M. feedings (720 cc.)

- ½ pound raw ground beef (The beef should be blended separately with a little milk before the other ingredients are blended)
- ½ cup any cooked or canned vegetables
- ½ cup any cooked or canned fruit
- 1 teaspoon butter
- ¼ teaspoon salt
- 1½ cups milk or enough to make up 720 cc

6 00 P M and 9 00 P.M feedings (720 cc.)

- ½ pound raw liver (chicken calf or beef blended separately as for beef)
- 1 cup rice spaghetti or noodles
- 1 slice whole wheat or rye bread
- ½ cup any cooked or canned vegetables
- ½ cup any cooked or canned fruit
- 1 teaspoon butter
- ¼ teaspoon salt
- 1½ cups milk or enough to make up 720 cc

Note All cup measurements represent standard measuring cups. The length of blending time for each food item averages 2 minutes but will vary with the consistency of the foods Due to a variation in the ingredients, the formula occasionally may be too thick to pass readily through the feeding tube At such times milk or water should be added until the proper consistency is obtained.

Minor Role of Gastrostomy in Head and Neck Cancer About the only accepted method of relief for dysphagia as practiced at Memorial Hospital thirty years ago was gastrostomy (Quick and Martin) whether the obstruction was at the cardia in the middle or upper esophagus or in the pharynx At that time little or no thought was given to the possibility of introducing a feeding catheter through the point of stricture In more recent years the many objectionable features of gastrostomy have been more fully realized and the practicability of a semipermanent tube (naso-esophageal feeding catheter) for high obstructions has been amply demonstrated so that gastrostomy is rarely performed on the Head and Neck Service at Memorial Hospital As a matter of fact this operation is used on our Service only about once a year and then only after repeated unsuccessful attempts at insertion of the naso-esophageal feeding catheter Gastrostomy is occasionally necessary in strictures following unsuccessful skin grafts of the pharynx, or in the terminal stages of bulky infiltrated tumors of the thyroid or upper esophagus. In most of the latter situations however the naso-esophageal feeding catheter can be inserted despite the difficulties

Chapter 5

IMMEDIATE OPERATIVE RISK AND FUNCTIONAL DISABILITY FOLLOWING THE SACRIFICE OF SPECIFIC ANATOMIC STRUCTURES OF THE HEAD AND NECK

As previously mentioned the necessary sacrifice of specific anatomic structures in radical surgery of the head and neck is often associated with a certain degree of operative risk and subsequent disability Other structures may be sacrificed with impunity With the purpose of curing cancer and preserving life the surgeon must evaluate these risks and assume the responsibility He must decide whether in the interests of the patient they are actually worth while, remembering meanwhile that life may be desirable to the patient and his family even at the expense of considerable operative risk disability and deformity

In certain cases the necessity of the sacrifice of a given structure is obvious at the time the operation is conceived and proposed to the patient It then remains to decide whether the patient is to be advised of all these unpleasant aspects of the case, or whether he is to be given a somewhat milder version while his family is appraised of the full facts In other cases the necessity for sacrifice may be unsuspected until the operation is in progress, and then the surgeon must take full responsibility guided by his judgment and knowledge of the degree of risk

Jugular Veins. The excision of all the veins (internal and external jugulars and their tributaries) of one side of the neck in unilateral neck dissection is followed by no complications Both internal jugular veins may be sacrificed with impunity in bilateral neck dissection performed in two stages. Should the necessity arise for the sacrifice of both internal and both external jugular veins in the same operation (simultaneous bilateral neck dissection) the additional operative risk is minimal Crile in 1905 reported that he had excised both internal jugular veins in one case, but mistakenly concluded that such sacrifice was dangerous unless at least one external jugular vein was preserved.*

* The possibility of the safety of resection of both internal jugular veins was brought to my attention in the early 1930s by a young Yugoslavian surgeon who was visiting for a few days at the Memorial *Hospital*. He stated rather casually that his surgical chief in Belgrade had practiced such bilateral sacrifice for many years with both impunity and safety At first the idea seemed to me rather fantastic and so far as I knew had never been recorded in the literature. Shortly thereafter I was faced with the somewhat disagreeable alternative of either leaving cancer behind in the neck or of resecting a second internal jugular vein.

Some months previously the patient had had a unilateral neck dissection for metastatic cancer and at the second operation I was attempting, under local anesthesia to excise a solitary apparently mobile mass in the

When during the course of neck dissection, a vein such as the internal jugular subclavian, or one of their larger branches is opened inadvertently (rather than sectioned between clamps or ligatures) there is often sufficient negative pressure in the proximal segment to suck air into the lumen of the vessel before it can be clamped Much has been written in the past regarding the serious sequelae incident to such air embolism In our clinic, although such a phenomenon has occurred many times, we have never observed any complications to follow such incidents

If the clamp holding the stump of the upper end of the internal jugular vein should slip it is ordinarily not difficult to replace the clamp although bleeding is brisk In other cases when an effort has been made to ligate the internal jugular vein unusually high under the posterior belly of the digastric muscle because of invasion by metastatic nodes at this point the stump of the vein may slip from the clamp owing to a combination of circumstances such as a fragile vein wall a faulty clamp or its faulty application In such instances it may be impossible to grasp the short venous stump by clamping and to place a ligature about it. This has occurred *several times on our Service at Memorial Hospital* The surgeon need have no particular concern as to the outcome in these cases Bleeding is first arrested by digital pressure over the jugular foramen A tampon of absorbable material about 3 cm in diameter such as Gelfoam or Oxycellulose is held in place over the area by a gauze packing, the end of which is brought out through the drainage opening in the lower neck The skin flaps then are sutured over the gauze tampon and a compression dressing is applied After three or four days the gauze tampon packing can be gently removed and the postoperative course is usually uneventful No fatality due to this accident has occurred in our cases

External Carotid Arteries. Both external carotid arteries may be ligated or resected at the same operation. There is no risk of cerebral complications nor because of the copious anastomotic network of smaller arteries and capillaries will there be noticeable change in the nutritional state of the tissues of the mouth or face or delay in healing of operative incisions of flaps supposedly supplied entirely by these arteries

Common or Internal Carotid Artery When the surgeon is faced with the decision of elective sacrifice of one internal (or common) carotid artery he must proceed on the assumption that *without the precautions* outlined in the following paragraph the operative mortality will be between 40 and 45 per cent Where such ligation is necessary because of hemorrhage (radiation slough operative injury) there is sometimes no alternative to immediate ligation if the otherwise fatal hemorrhage is to be stopped In such cases the mortality is high since no preliminary precautions can be taken In some cases however it may be possible for an assistant to maintain digital pressure over the bleeding site (*"finger in the dike") long enough to* arrest the hemorrhage while blood is being rapidly transfused with the purpose of bringing the pressure up to 120 mm Hg or more before the common carotid is occluded by clamp or ligature The artery can of course be surgically exposed, awaiting a hoped-for restoration of blood pressure

In the Head and Neck Clinic of Memorial Hospital an analysis was made recently of 88 consecutive cases of common and/or internal carotid artery ligation covering the period 1926–1952 (Moore and Baker) There was an over-all mortality of 27 cases—about 31 per

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opposite side of the neck On deep exposure the growth was found to be attached to and invading the wall of the internal jugular vein. Under the existing circumstance it seemed reasonable at least to explore the possibilities of the Yugoslavian maneuver and the First Assistant was directed to occlude by digital pressure, the jugular vein, while we proceeded leisurely to further mobilize the adjacent aspects of the tumor Meanwhile, the whole operating team and the stand-by anesthetist attentively watched for any evidence of physical or mental stress or change in pulse rate or blood pressure The patient under local anesthesia, remained conscious, his response to questions was alert and he complained of no *unusual sensations The pulse and blood pressure were* unchanged After about 20 minutes of digital compression, the vein was clamped and a portion resected along with the infiltrating tumor No untoward symptoms developed and the subsequent convalescence was uneventful From that time onward staged ligation (or resection) of both internal jugular veins was no longer considered hazardous and within a few years simultaneous resection of both internal jugulars became a standard procedure in selected cases.

cent. A further breakdown of the figures reveals a mortality of about 55 per cent in the first 20 cases of this series (1926–1937) with a gradual decrease so that in the last 34 cases (1948–1952) * the mortality had diminished to about 12 per cent This reduction from 55 per cent to 12 per cent in mortality has been accomplished without any grafting or anastomoses of vessels The mortality has been high in the cases where heparin had been employed The most significant disclosure in this analysis is the fact that the greatest percentage of hemiplegia and eventual death occurs in those cases in which the ligation has been performed at a time *when the blood pressure was low due to preceding hemorrhage or to shock* and that the chance of recovery is excellent if the interruption of blood flow can be deferred even for a short time while the blood loss is replaced †

Arterial Grafts and Vascular Anastomoses. Attempts have been made by several investigators to improve the percentage of survivals following common or internal carotid ligation by the use of vascular grafts or anastomoses between the external and internal carotid arteries While at first sight some of these reports might appear promising, actually in some of them the percentage of survivals is less than the average and in others the numbers are so small as to be of little or no statistical significance Except in rare instances (such as for example a moderate degree of invasion of the carotid bulb by carotid body tumor or a limited invasion of the bulb or the midportion of the common carotid artery by metastatic cancer) the morbid anatomy calling for ligation is usually so grossly abnormal and the emergency so acute that grafting or anastomosis of these arteries is not feasible Such gross abnormalities may consist of radionecrosis gross sepsis or the necessarily associated sacrifice of large portions of overlying soft parts so that an arterial graft, even if it could be sutured into place, of necessity would be lying in a bed of necrotic and septic tissue sometimes without any adequate flap of skin and subcutaneous tissue to cover it Arterial grafts would seldom be needed in any lesser situation

A further handicap in the performance of grafts of the carotid is the time necessary for restoration of the circulation In a majority of cases the interruption of the circulation through one side of an *inadequate circle of Willis* for even a few minutes (less time than required for the completion of a graft) is sufficient to cause cerebral complications On the Head and Neck Service at Memorial Hospital it is the considered opinion that a lessened operative mortality in situations where the common or internal carotid must be sacrificed is better promoted by attention to factors such as maintenance of normal blood pressure than by resort to the doubtful expedient of attempted arterial grafts During 1956 resection of as much as 4 cm of the midportion of the common carotid artery with reanastomosis of the several ends has been successfully accomplished in several cases The technique of this procedure is described in Figs 85A to C

Subclavian Artery In operations involving the root of the neck especially in cases of recurrent or infiltrating tumors, where the tissue planes cannot be identified separated and followed the costocervical trunk and even the thyroid axis may be accidentally torn near their origins Rarely the subclavian artery itself may be torn. Attempts at clamping a short torn stump of the above-mentioned branches of the subclavian are in most cases both futile and ill advised and may result in an even worse tear of the main artery itself The only practical method for immediate control of the copious hemorrhage is digital pressure over the bleeding point The tip of the palpating finger can usually then distinguish the subclavian artery itself and a ligature can be passed around it proximal to the bleeding point

Following such ligation, the radial pulse is

* Among the last 34 cases, with an over all mortality of 12 per cent, as mentioned above, there occurred a series of 15 consecutive cases without a single death, *while in the early 1940's* there occurred a series of 5 consecutive cases without a single recovery The latter observations are made as a warning to those who might be inclined to interpret a high percentage of recoveries in a short series of cases as final proof of the effectiveness of some particular method of management

† When one internal carotid artery is ligated the arterial circulation to that side of the brain can be supplied only through the following channels (1) Through the circle of Willis by way of the anterior and posterior communicating arteries (2) from the homolateral vertebral artery and (3) through anastomosis between the external and internal maxillary arteries with the ophthalmic artery by which backflow can occur should the external carotid artery remain intact

absent for the first few days at least, and the affected arm will be cooler to the touch than its fellow Although necrosis of the arm has been reported in one or two instances (Webb & Burford) following ligation of the subclavian there have been no serious sequelae in several cases at Memorial Hospital The relative safety of ligation of this artery must obviously depend upon the elaborate network of anastomoses about the shoulder which includes the following branches of the subclavian the vertebral, internal mammary transverse cervical transverse scapular and costocervical trunk and the following branches of the axillary artery thoraco-acromial lateral thoracic subscapular and anterior and posterior humeral circumflex arteries The latter branches of the axillary all anastomose with the intercostal arteries (branches of the aorta)

From a purely theoretical standpoint at least the internal mammary might seem essential for an adequate compensatory anastomatic circulation of the arm after ligation of the subclavian The internal mammary and vertebral are the first branches given off in the first portion of the subclavian and it would seem likely that if a ligature is placed proximal to the thyroid axis the internal mammary if not the vertebral would always be occluded However anatomists described considerable variation in the point of origin of the internal mammary and it is theoretically possible that a ligature can be placed proximal to the thyroid axis and leave it intact If the internal mammary is included then it is also obvious that the adequate compensatory circulation can occur by way of the intercostals which anastomose freely with the above-mentioned branches of the axillary artery

In the course of extensive operations of the root of the neck the clavicle may already have been sectioned, providing easy access to the bleeding point When this has not been done an emergency section of the clavicle may be indicated

In the final analysis the surgeon should not hesitate to ligate the subclavian artery proximal *to the bleeding point* rather than to risk failure and possibly fatal hemorrhage through unsuccessful attempts to clamp and tie short bleeding stumps or to suture a tear in the bleeding artery An unsuccessful attempt to stop hemorrhage from the subclavian will always result fatally

Recurrent Laryngeal Nerve In thyroid surgery the recurrent nerve should always be exposed and preserved When thyroid cancer is found to invade or surround the nerve requiring its sacrifice the only complication that follows is paralysis of the homologous side of the larynx. Unilateral recurrent nerve paralysis is an unfortunate but not particularly serious complication except in patients whose occupations depend a great deal on the use of the voice Inadvertent injury to the recurrent nerve is a *reproach to the surgeon* Permanent damage to both recurrent nerves and bilateral laryngeal paralysis is serious eventually necessitating a permanent tracheostomy unless a successful arytenoidectomy is subsequently performed

Superior Laryngeal Nerve The function of the superior laryngeal nerve is known to be mainly sensory to the epiglottis and aryepiglottic folds, and to the base of the tongue It is the motor supply to the cricothyroid muscle The superior laryngeal also has communications with many other cervical nerves and with the cervical sympathetics The complications following injury to this nerve indicate that its function is also concerned intimately with the complex reflex act of swallowing. The disability that follows section or severe trauma to the nerve consists mainly of failure of the glottic sphincter to close during the act of swallowing. There is also a tendency toward the pooling of saliva in the pyriform sinuses and the constant trickling of this saliva through the interarytenoid notch down into the trachea The disability may be severe or only moderate depending upon whether the trauma is to one or both nerves Such injury may occur during transverse infrahyoid pharyngotomy where the nerve may be inadvertently traumatized either by complete section or by undue stretching during retraction of the margins of the wound The complication is present to some degree for the first few days following all infrahyoid pharyngotomies In most cases to disappear in a few weeks When it persists beyond the reasonable period for naso-esophageal catheter feedings the results may be serious and sometimes fatal The complication tends to occur more often in the old than in the young, and when the transverse pharyngotomy incision has been made long, or when its borders have been forcibly retracted The possibility of this complication constitutes one of the greatest contraindications for a right

angled downward extension of the anterior pharyngotomy opening for exposure of the lateral pharyngeal wall.

The exact etiology of the complication is somewhat obscure As viewed by mirror the motions of the larynx are normal and the patient can phonate without difficulty The arytenoids and the cords approximate well There is however a characteristic pooling of the saliva in the pyriform sinuses suggesting a spasm (or failure to relax) of the cricopharyngeus and the inferior constrictor muscles It is difficult to test whether there is anesthesia of the corresponding side of the larynx, but in any case such anesthesia would be hardly a sufficient explanation for the complication

Superior laryngeal nerve paralysis is also found following heavy and successful radiation therapy of bilateral metastatic subdigastric nodes in which there is a marked progressive fibrosis and scarring in the upper lateral neck, causing physiologic section of both vagus nerves In these cases the first symptom is a progressive paralysis of the recurrent nerves so that phonation is lost. A progressive tendency to aspirate the ingesta follows—obviously due to paralysis of the superior laryngeal nerves From observation in cases of bilateral paralysis of the recurrent nerve in thyroid cancer it is plain that such dysphagia does not arise from the latter cause alone in the absence of dysfunction of the superior laryngeal nerves

The persistence of this complication in any case is hazardous Fortunately it tends to disappear provided the patient is fed by naso-esophageal catheter for a period of from several days to several weeks With this precaution there is only a slow though constant trickle of saliva between the arytenoids which is readily coughed up If the dysphagia persists long enough and the patient repeatedly tries to swallow there will be an almost inevitable development of tracheobronchitis septic pneumonia and lung abscess terminating fatally If the complication persists so as to threaten such an eventuality the only remedy is total laryngectomy removing a larynx which may be entirely normal except for the fact that it cannot function to separate and divert the inspired air and the ingesta from the hypopharynx into their proper channels—the trachea and esophagus respectively

Phrenic Nerve There is seldom any surgical indication for deliberate sacrifice of the phrenic nerve except in those rare instances where the growth directly invades the structure It may be accidentally cut however during a too-hurried dissection in the mid-portion of the neck especially if the deep dissection precedes postero-anteriorly at the bottom of an unnecessarily deep "pocket To lessen this risk one routine measure which obviates having to operate in the depth of this pocket is to begin the neck dissection (after dissecting back the skin flap) by severing the lower end of the sternomastoid muscle. With average care there is little risk of severing the main trunk but it should be remembered that while the phrenic nerve is formed mainly from the fourth cervical nerve it is reinforced by roots from the third and fifth cervical nerves Although the main trunk from the fourth nerve is preserved the other two may be sectioned unnoticed I have observed cases of phrenic paralysis in which I knew I had preserved the main trunk In the average patient sacrifice of the phrenic nerve results in no noticeable symptom or disability Even though the corresponding side of the diaphragm is paralyzed, the lessened respiratory excursion of the corresponding lung is well compensated by the normally functioning lung.

In other cases where there is a previous lessened function of the lungs as, for instance, in chronic emphysema fibrosis of the opposite lung, or in cases of tuberculosis where there may have been therapeutic permanent crushing of the opposite nerve, a section of one phrenic nerve and partial functional disability of the one remaining good lung may have serious significance *It is prudent*, therefore to exercise reasonable care in preserving not only the main trunk of the nerve but also its contributing branches from the third and fifth roots so that in the rare cases where pulmonary function is not of the best, serious complications can be avoided

Seventh Cranial Nerve If the main trunk of the facial nerve is exposed at the beginning of a parotid operation and the plexus is then dissected out, there is little risk of inadvertent permanent damage and disability of even a portion of the facial muscles. After identifying the main trunk of the nerve invasion of a portion of the peripheral plexus by the growth may necessitate sacrifice of one or more of its branches In every case, however the main

volved portion of the plexus should be spared, since even the slightest return of the function of any portion of the facial musculature will do much to lessen the degree of subsequent facial asymmetry Operative handling of the nerve will often result in a temporary paralysis Identification and careful preservation of the marginalis branch of the nerve, which supplies the musculature of the lower lip is important during neck dissection.

When at operation cancer is found to invade that portion of the parotid which is traversed by the main trunk of the seventh nerve there is no alternative except wide excision and sacrifice of the main trunk and a large portion of its plexus To relieve the paralytic ectropion a fusion of the eyelids (Figs 119–121) should be made at the completion of the main operation

In a considerable number of such cases (estimated at about 25 per cent) there will be a complete or almost complete return of function in the paralyzed facial musculature after a few months even after the resection of the main trunk and severance of the plexus. The spontaneous return of function in so high a proportion of cases after resection of a segment of the nerve casts serious doubts on the validity of all reported cases in which there was recovery following and due to nerve grafting. The most reasonable explanation of this phenomenon is that new motor pathways are established through the fifth cranial nerve Observations in such cases will be published from our clinic (Martin & Helsper) in the near future

Vagus Nerve The vagus nerve lies along the outer and/or posterior aspect of the common and internal carotid arteries The greatest risk of inadvertent injury during neck dissection occurs in the root of the neck when the internal jugular vein is clamped before section At this point the vagus nerve is less intimately associated with the artery than at higher levels and it is prudent for the surgeon to make doubly certain that the nerve is not included in the clamp Along its higher course the vagus is sometimes so intimately associated with a metastatic mass as to require excision of a segment if the growth is to be completely removed In such cases the nerve may be sacrificed with impunity and the only disability to be expected is ipsolateral paralysis of the larynx.

Hypoglossal and Lingual Nerves. In the subdigastric area or submaxillary triangle of the neck there is a possibility of injury to the hypoglossal nerve and to the lingual branch of the fifth cranial nerve The hypoglossal nerve is observed in all cases of radical neck dissection, coursing obliquely downward and crossing the internal and external carotid arteries to disappear under the stylopharyngeus muscle Further forward it is occasionally seen in the lower aspect of the submaxillary triangle just below the level of the submaxillary duct During its course it is seldom subject to great risk of injury by the careful surgeon, and is seldom invaded by cancer If such invasion should occur the nerve may be sacrificed with impunity The only disability to follow will be ipsolateral paralysis of the tongue which will interfere only moderately with speech and the mastication of food

The lingual branch of the fifth nerve is seen during neck dissection in the upper aspect of the submaxillary triangle just before it disappears under the posterior edge of the mylohyoid muscle It is rarely subject to injury in neck dissection and is involved by disease only when the growth invades deeply the floor of the mouth In the commando type of operation where both the mandible and the side of the tongue are resected this nerve must obviously be included

Cervical Sympathetics. These structures begin with the superior cervical ganglion high in the neck, and run downward along the posterior aspect of the common carotid artery through the middle inferior ganglion to join the sympathetic trunk of the thorax. In themselves the structures are of little surgical significance and since the branches in the mid neck are somewhat difficult to identify they undoubtedly are frequently injured or sacrificed in neck dissection When surgical manipulations reach the point of the carotid bifurcation a marked drop in blood pressure often occurs apparently due to overstimulation of the external carotid plexus. It has been found that the injection of a few drops of Novocaine into the adventitious tissues of the external carotid and the bulb will be followed by almost immediate restoration of the blood pressure

Carotid Sinus Syndrome Anatomically the carotid sinus is situated in the proximal portion of the internal carotid artery and adjacent areas in the carotid bulb and common carotid artery The main tissue component of the carotid sinus

is a fine and complicated nerve network with sensory nerve endings, forming the origin of the intercarotid nerve of Herring, which courses upward between the internal and external carotid arteries to join with the glossopharyngeal nerve The carotid sinus is a pressoreceptor whose function is the regulation of blood pressure Stimulation by pressure on the sinus by the blood itself tends to reduce the blood pressure when it begins to get too high

Under certain conditions (arteriosclerosis the pressure of an overlying tumor postoperative scarring, etc) the carotid sinus may become highly sensitive so that even the slight pressure incident to clinical palpation of the neck the pressure of a firm surgical dressing, the manipulations of surgery or even the turning of the head to one side may stimulate the sinus so as to cause what is known as the carotid sinus syndrome first clearly described by Weiss in 1933 This syndrome is characterized by a marked slowing of the pulse fall of blood pressure, loss of consciousness, and sometimes mild convulsions The syndrome may occur in the anesthetized patient, when at neck dissection during manipulations in the region of the carotid bulb the anesthetist will note a sudden and marked drop in blood pressure with slowing of the pulse

The syndrome occurs mainly in patients of the older age group who have marked arteriosclerosis Once established the hypersensitivity of the syndrome tends to persist indefinitely After head and neck surgery it is often initially observed at the first dressing, as the compression bandage is being wound around the neck. The patient complains of faintness and may go into complete syncope sometimes with mild convulsions. The pulse is absent or only faintly palpable, its rate slow and the blood pressure low If the patient is placed in a recumbent position, consciousness returns in a few minutes without any special restorative measures and without any apparent untoward aftereffects In some older arteriosclerotic patients without previous surgery the sensitivity may be so active and persistent that it is not practicable to palpate the lateral aspects of the neck except with the patient recumbent.

At operation the observant anesthetist should alert the surgeon at the first sign of carotid sinus syndrome and an injection of 1–2 cc of 1% Novocaine solution in the adventitia of the carotid bifurcation will immediately relieve the symptoms

Theoretically at least, some cases of supposed cardiac arrest (leading to opening the chest and massaging the heart) which occasionally occur during neck surgery or immediately following application of a tight neck dressing, may actually be cases of carotid sinus syndrome and would have recovered spontaneously if given sufficient time after Novocaine injection of the sinus or removal of an over tight bandage

Horner's Syndrome The occurrence of Horner's syndrome at least temporarily following neck dissection is fairly frequent The tetrad of symptoms—ptosis miosis, enophthalmus and anhydrosis—commonly follows trauma or undue stimulation of the cervical sympathetic trunk and stellate ganglia lateral to the carotid sheath In routine neck dissection the operative procedure is not deliberately extended posteromesial to the carotid sheath, and the cervical trunk therefore should not be traumatized Inadvertently however the dissection may be carried sufficiently deep to injure the sympathetic chain, or in other cases the metastatic disease may be so situated that the dissection is necessarily carried to this deep level

The only clinical significance of Horner's syndrome especially if the patient is female, may be the cosmetic disfigurement—the small pupil and moderate enophthalmos. In a large proportion of cases this disorder may be expected to disappear within a few months In 5 to 10 per cent of the cases it may remain permanently During the first few postoperative days the symptom complex is mainly objective in nature that is it will be discovered during the course of clinical observation In other cases it may become evident only when the patient is up and about When looking into the mirror the inequality in the size of the pupils is noted, and the patient may become concerned mainly because of his appearance

When the syndrome is of long standing it is said sometimes to lead to heterochromia (depigmentation of the iris) hypotonia of the eyes and even to cataract Several cases of Horner's syndrome of long standing have been noted in our clinic, and have been carefully observed by our ophthalmologist, without discovering any of these sequelae

Exposure of Dura and/or Cerebral Cortex. In operations for cancer of the paranasal sinuses,

purposeful attempts to eradicate all of the disease in the ethmoid area or cribriform plate may result in exposure of the dura and some times even of the cerebral cortex. Since the anterior lobes of the brain are not intimately concerned with vital functions few complications will result if the danger of infection can be eliminated Should leakage of cerebrospinal fluid occur from the area of the cribriform plate, or should dura be torn or excised so as to expose the cerebral cortex, the latter defects will of course be covered by the same split skin graft that is routinely used in radical maxillary resections Firm packing of the transmaxillary defect will immobilize the graft and by its pressure effectively seal off cerebrospinal leakage Due attention should be given to massive doses of antibiotics and the packing over the skin graft should be left in place for at least six days

Sacrifice of Eye Only during recent years has there been an adequate appreciation of the surgical anatomy of cancer of the paranasal sinuses especially of the susceptibility of the ethmoid cells to invasion by cancer not only when the growth is primary but also from its extension from the maxillary antrum or the nasal cavity The frequency of postoperative recurrence in this general area and in the ethmoid region itself poses the question as to whether cancer which obviously or even possibly invades the ethmoids from adjacent areas can be excised completely without sacrifice of the eye *

In radical resection of the maxilla the ethmoid cells can be completely exenterated only by an associated exenteration of the orbit Sacrifice of the eye is likewise essential if the roof of the antrum (floor of the orbit) is invaded by cancer

From the psychologic standpoint the sacrifice of an eye is naturally considered a serious handicap by the patient and his family Sight is rightly considered to be the most important of the five senses, and to the average layman the loss of one eye suggests the loss of half his power of vision The benefits paid by insurance companies for the loss of one eye support this popular conception As a matter of fact however the sacrifice of one of two good eyes is of less serious consequence to the visual acuity and to the patient's comfort and capacity for enjoyment of life than is popularly supposed.

Experience has shown that if the possibility of sacrifice of an eye is recognized when an operation is proposed and the question put to the patient assent is almost always obtained, especially if it has been previously mentioned and the proposition is not put too bluntly sometimes with the assurance that that eye will be saved if possible † When the necessity for sacrifice of an eye is discovered during the operation, the problem is different The surgeon must then proceed on his own responsibility taking the eye if he feels it required to save life even without specific permission If the vision of the remaining eye is 20/20 its acuity remains the same following the loss of its fellow and the only functional disability will be the loss of stereoscopic vision (to a large extent overcome by experience) and a somewhat narrowed field of vision Persons with only one eye but with good vision in that eye may obtain a license to drive an automobile

Submaxillary and Parotid Ducts. In operations involving the floor of the mouth or mucosa of the cheeks the parotid and submaxillary ducts will of necessity be transected When these operations are performed entirely within the mouth, no fear need be entertained for the subsequent function of the respective major salivary glands or their ducts and the operative wounds should be closed without regard to these structures Drainage from a resected salivary duct will either re-establish itself without difficulty by the development of a salivary fistula within the mouth or the affected salivary gland will atrophy When one or both submaxillary ducts are transected or excised in operations involving the floor of the mouth the corresponding submaxillary salivary glands will usually enlarge for several months as the result of stasis. In some cases such swelling may raise some difficulty in the differential diagnosis of metastasis to the submaxillary triangle In large operative defects of the anterior mouth and chin ligation to occlude the parotid ducts permanently is sometimes called for to relieve

* The indications for sacrifice of the eye in radical surgery for antral cancer were recognized by J Bland Sutton in the 1890's.

† When a normal eye is excised under such circumstances. the surgeon should take the trouble to see that it is sent to an eye bank for use in corneal grafting.

the nuisance of constant soakage of the dressings by saliva (Fig. 113)

Thyroid and Parathyroid Glands. If indicated by the morbid anatomy, the entire thyroid gland should be excised. In most patients there will be only slight, if any manifestations of hypothyroidism and if such symptoms do develop they are readily relieved by supplementary thyroid medication. As a matter of fact following the most careful attempts at complete thyroidectomy, Geiger-counter measurements after the administration of radioactive iodine usually show considerable pick up of the isotope in the neighborhood of the scar indicating that some thyroid tissue still remains

The parathyroids are difficult to identify with certainty during radical thyroid surgery In most cases of total thyroidectomy it is probable that one or more of the four regular parathyroids will be left behind even without any special precaution Even if all four were taken, the accessory parathyroids (estimated by anatomists to average 12 in number) will immediately take on at least part of the function and eventually all of it in most cases. In all cases of total or subtotal thyroidectomy the symptoms of hypoparathyroidism should be watched for and immediately treated. Such symptoms are tingling of the hands and feet, progressing to muscular aches and pains and finally and most important, to tetany

Thoracic Duct The anatomy of the thoracic duct in the root of the left neck is somewhat variable The arch coming from behind the common carotid may be low and the duct may not be seen at operation. In other cases the arch is high (up to 5 cm) above the level of the clavicle In left neck dissection the duct is usually recognizable and can be preserved If the duct or one of its branches is torn, there will be a leakage of chyle The leaking tributary or the main duct itself should be immediately clamped and ligated with nonabsorbable suture material No fear need be entertained as to the adequacy of chylous return from the intestinal tract, for there is an accessory duct (lymphatic duct) on the right and many anastomoses. Even in right neck dissections chylous fistula may occasionally develop from a sectioned right lymphatic duct.

Chapter 6

GENERAL AND LOCAL COMPLICATIONS OF HEAD AND NECK SURGERY

In addition to the specific or localized functional disturbances and disabilities (discussed in Chapter 5) there are a number of general complications that may occur following major head and neck surgery These general complications are concerned with blood loss, interference with the vital functions of breathing and swallowing, wound infection, and wound healing

SHOCK

The classic picture of surgical shock characterized by an anxious apprehensive patient with a cold clammy skin of dusky color a rapid pulse and low blood pressure need but seldom occur in modern head and neck surgery Too much emphasis was assigned formerly to the unique importance of painful stimuli from surgical manipulations in the etiology of shock with inadequate realization that in operations in certain areas of the body an identical picture of shock would result from blood loss alone In surgery of the head and neck (exclusive of the brain) painful stimuli contribute little in the etiology of surgical shock and the complication can be either prevented or relieved by the correct degree of blood replacement Since the development of blood banks this need is facilitated by the routine attachment of a transfusion apparatus to the intravenous system in all cases of major head and neck surgery (Fig 35)

HEMORRHAGE

The structures of the head and neck are more copiously supplied with blood than is any other similar volume of body tissues The intimate capillary circulation tends to be greater in the tissues of face mouth and pharynx than elsewhere in the body For this reason significant blood loss may occur during the operation, not only from spurting vessels but also because of a slow continuous ooze from capillaries in all portions of the wound Although there will be a steady seepage of blood throughout a long head and neck operation the normal blood volume can usually be maintained by continuous transfusion the rate of which is determined both empirically by observation of the blood loss and by the blood pressure and pulse rate

As has already been pointed out, any or all of the larger blood channels of the neck (arteries and veins) may be ligated or excised without risk except the common and internal carotid arteries Under certain conditions the sacrifice of one common carotid artery and/or its internal branch may be justified In combination operations (neck dissection with excision of a primary tumor in the mouth) the external carotid artery should be ligated routinely at the end of the neck dissection before the mouth is entered All larger arteries (the external carotids inferior thyroids, superior thyroids transverse cervical suprascapular etc) that may be cut across as an essential part of the operation should be doubly ligated with chromic

catgut so as to eliminate the risk of failure of a ligature in the immediate postoperative period

In radical maxillary resection there is always fairly copious hemorrhage particularly during and immediately following the mobilization (by scalpel scissors, and bone chisel) of the surgical specimen, including the orbital contents Control of bleeding during these manipulations must await the final prying loose of the maxilla from its bed, before finger tamponing and then clamping the major arteries (internal maxillary and ophthalmic and their branches) There will also be copious general oozing from the whole wound surface which can be effectively reduced by a bulky gauze tampon held in place for three to four minutes As a matter of fact such a tampon is often most effective if inserted immediately following the removal of the specimen and held in place for a few minutes before deciding upon the necessity for ligating the stump of the internal maxillary artery

It was formerly the practice at the Memorial Hospital to ligate one or sometimes both external carotid arteries before such maxillary resections but we no longer consider such a precaution necessary—nor as a matter of fact, reasonable—in cases of potentially metastasizing growths of the paranasal sinuses or maxilla A serious objection to prophylactic ligation of the external carotid is the resultant scarring of the neck which will seriously interfere with the surgical treatment (neck *dissection*) of any subsequent cervical metastasis There is no better example to illustrate the *importance* and value of rapid and efficient operating to minimize the hazard of blood loss *than radical* surgery of the maxilla

The oozing from the raw surface in the intrinsic larynx following partial laryngectomy may be a troublesome complication It is usually not possible to make an epithelial closure in such partial laryngectomy *wounds within* the larynx but ligation of the larger bleeding points and efficient tamponage for several *minutes* with a sponge saturated with thrombin or careful packing with Oxycell *and five to ten* minutes delay in closing the laryngofissure wound is usually sufficient to arrest brisk bleeding. Repeated suction should be made through the tracheostomy tube to remove any *moderate* seepage from the bronchial tree

Gastrointestinal Hemorrhage An *occasional* complication following head and neck surgery is gastrointestinal hemorrhage In a typical case, the patient, who apparently has done well for the first few days after operation, suddenly vomits or regurgitates a considerable quantity of blood and is found to be in shock In cases where the operative procedure has involved the oral cavity or the pharynx it is natural that the nurses and the surgical staff should consider first the possibility that the bleeding comes from the suture line within the oral cavity or pharynx The former can be checked by direct inspection but after a pharyngeal operation such as total laryngectomy or pharyngectomy the hypopharynx itself cannot be visualized clearly enough to resolve the doubt, and in these cases the surgeon will find it difficult to resist the impulse to open the wound from the skin surface to locate the bleeding point. As a matter of fact only in rare cases has bleeding occurred within the first 24 hours from a spurting vessel in the mucosal edge of a pharyngeal closure Whenever copious hemorrhage occurs from any part of the body there naturally will be an instinctive impulse on the part of the surgeon to expose directly the bleeding source if at all possible In cases of hemorrhagic vomiting following head and neck surgery this impulse should be restrained until due consideration has been given to the likelihood that re-opening the neck wound will not solve the *problem*

The actual source of vomited blood occurring after several days is most likely to be a hiatus hernia duodenal ulcer or esophageal varices The most frequent inciting cause of such hemorrhage is prolonged spasmodic coughing, such as is likely to occur in operations which include a tracheostomy In these cases frequent suction of the tracheostomy tube and trachea is called for in order to keep the bronchial tree cleared of secretions Such suctioning (unless done gently) often defeats its purpose since it tends to excite several spasms of coughing which in turn tend both to raise intrathoracic and venous blood pressure in any esophageal varices already present and also (by the diaphragmatic spasm) to pinch the hernial sac so as to cause or to exacerbate an ulcer of the gastric mucosa at that point Acute episodes of bleeding from chronic gastric or duodenal ulcer can obviously be precipitated by the anxiety state preceding and following operations for cancer ACTH and cortisone are sometimes used postoperatively as general tonics or for the relief of *tracheitis sicca*

From the theoretical standpoint at least these substances may increase the likelihood of bleeding from a pre-existing ulcer since one of their actions is to increase the secretion of gastric proteolytic ferments and hydrochloric acid.

In many cases a hiatus hernia (a fairly common cryptic disorder) would have remained silent except for the trauma produced by the sphincteric action of the diaphragm during repeated and protracted spasms of coughing The bleeding from the hiatus hernia may occur both upward into the esophagus and/or downward into the stomach Esophageal varices occur mainly in arteriosclerotics or in patients with hepatic cirrhosis

The first consideration in these cases is identification of the source of bleeding that is *does it come from the operative wound within the pharynx or from lower down in the gastrointestinal tract?* Sedatives should be administered to relieve apprehension and to quiet the often overstimulated cough reflex Transfusions should be given after which liquid diets of the Sippy type should be initiated X ray studies may be taken within 24 hours and usually serve to pinpoint the bleeding source

Prophylactically it is of some service to elicit histories in suspected cases of duodenal ulcer and to obtain esophagrams in cases of marked arteriosclerosis and hepatic cirrhosis as well as in patients who have had so-called mild "anginal" attacks. A persistent and unexplained anorexia with tube feedings in the postoperative period should not be passed over lightly as being mainly a temperamental distaste for the nuisance of nasal tube feedings It is often an important premonitory symptom of a gastroduodenal ulcer which may soon manifest itself by a copious gastrointestinal hemorrhage With such premonitory symptoms it is prudent to make x ray studies of the upper gastrointestinal tract With a preoperative diagnosis of any one of the three predisposing states (hiatus hernia duodenal ulcer esophageal varices) some precautions can be taken to reduce to a practical minimum an otherwise helpful productive cough and the sometimes overzealous suctioning of a tracheostomy tube by well-meaning nurses

HEMATOMA AND CHYLOMA

With adequate drainage (a strip of Penrose rubber tubing not sewed in too tightly) and adequate pressure on the skin flaps and a catheter for sump-suction drainage hematoma should not occur in the neck following neck dissection When such hematomas do form the usual cause will be an inadequately tight pressure dressing Instead of opening the wound widely and evacuating the hematoma at the time of the first dressing it is often possible to remove the soft clot by suction using a Yankauer suction tube with the metal tip unscrewed Brisk bleeding from a slipped ligature of an artery may occasionally occur despite all reasonable precautions The obvious remedy is to open the flaps and to secure the bleeding points

It has long been known to surgeons that where a fresh bulky adherent clot covers a raw surface (traumatic or surgical) a steady ooze tends to persist until the clot is detached and removed so as to terminate the vicious cycle For this reason a hematoma which raises the flaps in a neck dissection (or other surgical wound) should be evacuated promptly

Hematoma in Thyroid Surgery The occurrence and management of small hematomas and serum collecting in undrained thyroid surgical wounds has been discussed under the heading *Drainage* in a previous chapter (*see* Chapter 3 p 62) Bulky hematomas in thyroid surgery caused by a loose ligature or an unligated vein are rare but the complication is of significance since it may cause serious respiratory embarrassment from pressure on the trachea unless discovered immediately and evacuated.

With double ligature of both superior and inferior thyroid arteries bleeding should never occur except from an open vein which because of markedly lowered blood pressure did not bleed at operation and therefore was not noticed

Chyloma Accidental opening of the thoracic duct may occur during left neck dissection Unless the tear is noted and the duct properly ligated a chyloma may form in the wound the sequelae of which tend to be more troublesome than those of hematoma If the escaped chyle is confined in the wound it tends to form an adherent clot resembling "cottage cheese" which infiltrates the adjacent wound surfaces to produce an edematous induration of the skin flaps

The remedy in such cases is to lay back the skin flaps evacuate the chylous clot as thor

oughly as possible and ligate the source of the oozing. If it cannot be found the wound should be packed wide open awaiting eventual spontaneous closure of the fistula The chyle infiltrated borders of the wound will always be slow to heal.

SUBCUTANEOUS EMPHYSEMA

When either the trachea or larynx is incised as in tracheostomy or laryngofissure air may escape into the subcutaneous layers of the wound If the air is held there under sufficient pressure it may escape into the subcutaneous tissues rather than through the skin incision and result in subcutaneous emphysema Once in the subcutaneous fat, the air bubbles may travel fairly long distances from the neck up into the face (cheeks and eyelids) or down into the anterior chest wall or even down into the abdominal wall to the navel or below The complication occurs most often following laryngofissure for partial laryngectomy—usually within the first 12 hours or not at all It tends to develop rather abruptly following one or two strong efforts at coughing.

The appearance is characteristic and unmistakable The swelling of the face and eyelids may approach the grotesque Crepitation is felt throughout the affected areas Subjectively the patient has little complaint, but before the advent of antibiotics the temperature usually rose to 103 –105° F unaccompanied by any other significant objective symptom When postoperative antibiotics are given as a routine the complication is associated with only a moderate rise in temperature

If no further air escapes into the subcutaneous tissues the emphysema usually absorbs within three or four days Few precautions against this complication can be taken in simple tracheostomy but in laryngofissure the incidence of subcutaneous emphysema is at least reduced by suturing the skin loosely around the tracheostomy tube thereby leaving some means of egress for air that may escape from the trachea into the wound One expedient is to leave one skin suture above and one below the tracheostomy tube untied for the first 24–48 hours

INFECTION—WOUND SEPSIS

In modern radical surgery of the head and neck a large proportion of operative wounds extend from the tissues of the neck into the oral cavity and/or pharynx, and as a consequence the wound surfaces are unavoidably and grossly contaminated In the days before chemotherapy and antibiotics the high mortality—or at least morbidity—that resulted from failure of primary healing constituted a hazard of almost prohibitive degree for many operations now carried out with comparative safety

The general measures for the prevention and control of sepsis have already been described under *Postoperative Care* in Chapter 4 and there remains to be discussed under the present heading the complication of failure of wound healing.

Separation of the Suture Line Within the Mouth. In the ideal clinical course following surgical entry of the mouth or pharynx, the suture line heals by primary intention, or at least with only slight superficial separation leading to complete union within two weeks In some cases that are eventually entirely successful this ideal may not be achieved but nevertheless the separation of the suture line is so moderate and so superficial that satisfactory healing occurs after only slight delay If the separation of the suture line within the mouth or pharynx extends deeply enough to connect with the neck dissection wound or other incision in the neck the period of morbidity will be longer but closure of the salivary fistula should take place within a few weeks For instance, a small salivary fistula occasionally occurs about four or five days after total laryngectomy combined with neck dissection If such fistulas remain small they usually close within a period of about a week and therefore do not necessarily delay the patient's discharge from the hospital

If wounds that enter either the mouth or pharynx are properly closed in layers there should not be any extensive breakdown or opening between the wounds in the mouth or pharynx and the neck Such wide breakdowns are due in most cases to faulty technic such as insufficient resection of bone or faulty apposition of soft parts because of insufficient mobilization.

It is obvious that communication between

the mouth or pharynx wound and the neck dissection causes the whole surgical fields to become grossly contaminated by wound discharges mixed with saliva containing numerous saprophytes Before the advent of antibiotics such wounds frequently sloughed deeply to terminate in erosion of large blood vessels and hemorrhage

Influence of Diabetes or Liver Dysfunction on Wound Healing. In many cases gross infection and breakdown of wounds are due to some associated disease such as diabetes or to disturbances of liver function and protein metabolism in chronic alcoholism The susceptibility of the diabetic patient to pyogenic infections is common knowledge and the importance of preoperative control of diabetes is generally accepted In most mild cases the operative risk can be almost entirely eliminated by control of the carbohydrate intake and administration of insulin, with an uneventful postoperative course In other cases, however the same degree of diabetic control is not sufficient, and the postoperative course will be attended by a series of medical and surgical complications The wounds within the mouth show little or no sign of healing after the first day or two A narrow margin of necrosis appears along the wound edges becoming progressively a little wider and deeper and accompanied by gradual separation of the deep layered closure of the wound With gross contamination of the neck dissection or laryngectomy wound sepsis causes a steady rise in temperature, with increasing difficulty in control of the blood and urine sugar Finally with failure of insulin to control the sugar metabolism the case may terminate fatally with typical septicemia.

It is my impression that severe diabetes of long duration may produce tissue changes which in themselves are unfavorable to healing, and that high blood sugar *per se* despite any high kidney threshold may likewise promote sepsis and be unfavorable to wound healing.

PULMONARY COMPLICATIONS—RESPIRATORY OBSTRUCTIONS

Serious pulmonary complications progressing to frank bronchopneumonia and sometimes to lung abscess should no longer be a frequent complication of head and neck surgery * This complication has been almost entirely eliminated by antibiotics

In head and neck surgery however there still remains a specific form of pulmonary complication associated with and initiated by respiratory obstruction With such obstruction there is always a greater difficulty with the inspiratory (rather than the expiratory) phase In the strained and prolonged effort to take in sufficient air whatever discharges (blood and/or saliva) are present in the hypopharynx tend to be drawn down into the bronchi rather than to be coughed up The patient with even a moderate degree of respiratory obstruction finds it difficult or impossible to cough effectively Review of a series of postoperative fatalities in head and neck surgery will reveal that the majority of complications were initiated or compounded by respiratory obstruction Once initiated the associated complications may persist even after the respiratory obstruction has been relieved by tracheostomy

It is prudent therefore, to anticipate such difficulty by the liberal use of prophylactic tracheostomy and immediate resort to the operation if obstruction develops unexpectedly

PNEUMOTHORAX AND PNEUMOMEDIASTINUM—AIR SUCKING WOUNDS IN THE NECK

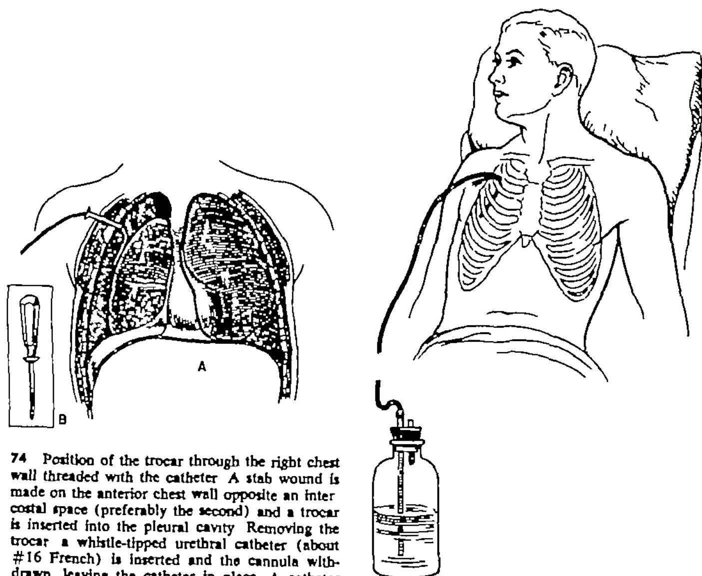
Pneumothorax is an occasional complication in extensive surgery of the anterior lower neck most of the cases occurring in thyroid surgery especially when the anesthesia is difficult and attended by abnormally deep or spasmodic respiration In such cases during the deep inspiratory phase air tends to enter the superior mediastinum to be at least partially expelled during the expiratory phase producing a characteristic air-sucking wound in the root of the neck Part of the air collects in the superior mediastinum and sometimes comes under such

* The author can remember vividly the ominous implications of such complications in the 1920's and 1930's, especially in the older age groups In those days bronchopneumonia was one of the most serious hazards of head and neck surgery following general anesthesia, usually ether

tension as to rupture into one or other of the pleural cavities.* Pneumothorax is just as likely to be contralateral as homolateral, and in about 50 per cent of the cases bilateral Bowden and Schweizer have described 18 cases occurring on the Head and Neck Service during a five year period at Memorial Hospital Of these, 12 (60 per cent) occurred during thyroid surgery The theory that *pneumothorax is often caused by* injury to the apex of the pleura is unsound since in the typical neck dissection or thyroid operation the pleura is separated from the field of exploration by a layer of soft tissues several centimeters in thickness, consisting in part of the scalene muscles.

Pneumothorax may be recognized early if *both the surgeon and the anesthetist* keep its possibility in mind, especially in cases where an air-sucking wound develops in the root of *the neck. The air-sucking sound is unmistakable and to the inexperienced might suggest by itself* that the pleura is already open. As a matter of

THORACENTESIS FOR PNEUMOTHORAX



74 Position of the trocar through the right chest wall threaded with the catheter A stab wound is made on the anterior chest wall opposite an inter costal space (preferably the second) and a trocar is inserted into the pleural cavity Removing the trocar a whistle-tipped urethral catheter (about #16 French) is inserted and the cannula withdrawn *leaving the catheter in place. A* catheter with a connecting tube is attached to underwater drainage.

75 The catheter in place, connected with underwater drainage.

The superior mediastinum is bounded anterosuperiorly by the pretracheal strap nodes and therefore actually extends for a short distance up into the neck. For this *reason, when the* strap muscles are cut as in thyroid surgery or when forcibly retracted as sometimes may be necessary to explore the root of the neck, the superior medeastinum is entered. The reason tension pneumomediastinum may occur in *some of these cases* is that the upper end of the sternum narrows the superior mediastinum at this point so that air may be trapped substernally

fact this is seldom if ever the case—the air so far being sucked only into the superior mediastinum and then expelled. The phenomenon, therefore, merely suggests an increased possibility that pneumothorax will develop The sound of such an air-sucking wound is rather annoying and distracting to the surgeon, who cannot help but feel that more air is continually being sucked into the mediastinum on inspiration than is being expelled on expiration At first hand it might seem reasonable to pack a gauze sponge into the root of the neck so as to block off the exchange but as a matter of fact such an expedient is highly objectionable since the packing tends to separate the tissue planes more widely between the neck and the mediastinum A much more reasonable maneuver is to have an assistant place one finger lateral to the trachea at the root of the neck which in most cases blocks the opening and eliminates the disturbing sound and lessens the tendency toward increase in volume of the pneumomediastinum. It is always prudent to have an immediate postoperative x-ray as soon as the patient returns to his bed in all cases where there has been an air-sucking wound during the operation

The symptoms of actual pneumothorax consist mainly of a sudden change in the pattern of respiration usually to a shallow abdominal type with evidence of circulatory failure Once suspected, the diagnosis should be immediately proved on the operating table by an exploratory puncture of the upper anterior thorax where the air is more likely to accumulate Thoracentesis and underwater drainage of the air should be established immediately The technic is shown in Figs 74–75 If pneumothorax is suspected after the patient is returned to bed, there is usually time to take an emergency x-ray As soon as the check by x ray within a day or two shows that the major portion of the air is absorbed, the tube is withdrawn

the soft palate and some degree of dysphagia, especially at first. In the final analysis, however such a form of closure represents the choice of the lesser evil and most patients eventually learn to swallow adequately with only a moderate degree of difficulty

It is significant that pharyngeal stricture seldom follows when immediate closure of the pharyngeal wound has been made by any one of several technics of direct approximation of the mucosal edges without resort to skin grafting (Chapter 21) Even though there may be a separation of the mucosal suture line and temporary or semipermanent fistula or pharyngostome nevertheless stricture is rarely a problem On the other hand when skin grafts on stents are employed for pharyngeal closure there is almost always some stricture requiring bougienage sometimes for an indefinite period This fact by itself is to my mind one of the greatest disadvantages of skin grafting in the pharynx.

Fortunately radical surgery of the head and neck for cancer does not interfere with the function of the alimentary tract below the level of the cricopharyngeus The bottleneck between the base of the tongue and the upper end of the esophagus can be readily bridged by a naso-esophageal feeding catheter This device completely overcomes all the difficulties of alimentation in the immediate postoperative period or during an acute radiation reaction and gastrostomy may now be considered as completely outmoded in dysphagia arising at the pharyngeal level With a naso-espohageal catheter in place fluids may be given immediately following the patient s return to bed, and full nutrition established within 24 hours The long-range problem of dysphagia at the pharyngeal level is of course another matter

Even after such relatively moderate procedures as radical neck dissection, which cause no great interference with the act of swallowing, a naso-esophageal catheter should be routinely inserted to tide the patient over the first day or two until he becomes accustomed to the paresthesia of the neck and throat and the tight compression dressings, which would otherwise prevent the taking of nourishment

LYMPHEDEMA

Removal of both internal jugular veins was formerly considered to leave no adequate channel for venous return flow from the brain and, therefore, to be incompatible with life This concept, of course, is false as there are many adequate alternate pathways and loss of both internal jugulars entails no physiologic risk The procedure particularly in bilateral neck dissection, has become generally accepted during the past two decades As a matter of fact, the complications and disabilities that follow bilateral neck dissection are due rather to interruption of the lymphatic channels from the head, especially those that accompany the venous channels into the lateral aspects of the neck, particularly when combined with the excision of one or other midline viscera (larynx or thyroid) Lymphedema, if it occurs at all, is usually not apparent for the first two or three days. It then begins and increases in severity for a week or ten days to persist for a period of weeks, months or even permanently In one case of bilateral neck dissection and thyroidectomy very marked lymphedema persisted for over a year At the present writing, three years later the patient states that the swelling occurs only occasionally, and then to a slight degree

The swelling of the face eyelids, and tongue may be so marked as to be grotesque but as with subcutaneous emphysema there are few, if any, subjective complaints of discomfort, except that the swollen eyelids may interfere with vision and the swelling of the tongue be great enough to make it protrude from the mouth exposing it to trauma from the incisor teeth An optimistic and encouraging attitude should be maintained as the situation is much less serious than the appearance would indicate The swelling of the eyelids is temporarily relieved by massage, attempting to press the accumulated lymph out into the temporal region A low-salt diet and sodium removing resins are of some assistance but cannot be expected to bring complete relief

POSTOPERATIVE GRANULOMA OF THE LARYNX AND TRACHEA

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MALNUTRITION—DYSPHAGIA—DYSMASESIS—DYSGEUSIA

Some degree of malnutrition is commonly found in patients with cancer of the mouth and pharynx both before and during treatment In the first place, a dietary deficiency with avitaminosis is a frequent etiologic factor in mouth and pharynx cancer Such patients tend to be undernourished. Second, with the development of a painful tender cancerous ulcer within the mouth or pharynx, eating becomes difficult, leading to further malnutrition During treatment, either by surgery or radiation, dysmasesis (difficulty in mastication) dysgeusia (loss of taste) and dysphagia may all be present and an already impaired nutritional status may deteriorate further The act of mastication necessitates not only the use of opposing teeth to grind the food, but also the muscular activity of the tongue and cheeks to manipulate the bolus during the process of chewing. Dysmasesis may result therefore either from a loss of continuity of the mandibular arch or from loss *of substance or active mobility of the tongue* or from both The rotary grinding action of the molars is not possible without a complete mandibular arch and bilateral function of the temporal masseter and pterygoid muscles The problem of the patient with dysmasesis following surgery is somewhat similar to that of an edentulous patient who cannot or will not wear full upper and lower plates In either case, adequate and healthful nourishment is assured only by the food being ground or pureed.

In defects of the upper alveolus and palate the dysphagia is severe unless the defect is plugged with a gauze or rubber sponge or covered with a prosthesis The dysfunction of such palatal defects is much more readily relieved than those of the lower jaw The act of swallowing is initiated by pressure of the tongue against the hard palate forcing the bolus or liquid to the pharynx where the pharyngeal musculature takes over A loss of substance or of active mobility of the tongue therefore, interferes with swallowing as well as with mastication that is, there may be a varying degree *of dysphagia and the patient will have to com*pensate for the dysfunction by tilting the head backwards so that the bolus may enter the pharynx partly from the force of gravity

Dysphagia may also result from a narrowing of the channel of the pharynx In radical excision of cancer of the posterior cheek tonsil or soft palate the closure of the oral and pharyngeal wound is usually best effected by shifting the edge and base of the tongue laterally and upward into the defect (Fig. 273) With such a maneuver there is always some narrowing of the pharyngeal aperture at the level of

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spiratory channel is obviously of much greater significance than when granulation tissue of similar bulk occurs in other and wider channels elsewhere in the upper respiratory and alimentary tracts

Granuloma Following Partial Laryngectomy Following a fairly wide excision of a vocal cord and underlying cartilage, there is only occasionally any possibility of suturing mucosa to mucosa, and the wound within the larynx (1–2 cm in diameter) must therefore be left open Granuloma following partial laryngectomy is a well recognized complication The practice 25 years ago when these granulating masses appeared was to rule out clinically the possibility of recurrence by clinical examination and then leave the masses to disappear spontaneously after a period of a few months In modern practice such conservative management is not reasonable. These granulomas often gain such size as to cause significant narrowing of the airway and a great deal of relief can be obtained by the removal through laryngoscopy If the granulomatous mass approaches 1 cm in size it should be removed

Granuloma Following Intubation. With intravenous thiobarbiturate anesthesia for head and neck surgery tracheal intubation is essential except in those cases where a preliminary tracheostomy has been made During the act of intubation or as the result of long-continued pressure from the breathing tube the structures of the intrinsic larynx, particularly at the glottis, are apt to be traumatized unless there is great gentleness during the insertion of a properly sized tube Soreness on swallowing and slight hoarseness is a common temporary complaint in patients who have had tracheal intubation In most cases there is complete recovery within a few days About 15 years ago when we first began the use of intravenous anesthesia such trauma was more common than at the present, often resulting in the development of granulomas of the intrinsic larynx, coming on several weeks after the operation, interfering with function, even when small and sometimes reaching such a size as to narrow the airway at the glottis. With the perfection of more skillful technics of endoscopy and intubation by the anesthetist and the development of better apparatus such as laryngoscopes specially designed for this purpose and a greater assortment of sizes calibers and consistencies of the breathing tubes, and with more expert use of preliminary sedation and topical anesthesia these complications have markedly lessened. The well-trained and competent anesthetist should be highly skilled in these particular maneuvers Most cases of laryngeal and post anesthetic trauma occur with the less experienced anesthetists

Granuloma of the Trachea following Tracheostomy. It is fortunate that the trachea itself can be entered by way of a tracheostomy repeatedly if necessary and when the need for the respiratory by-pass ends, and the cannula is withdrawn the tracheostomy tract heals throughout with no sequelae in almost all cases. Rarely following withdrawal of the cannula there will be gradually increasing respiratory distress, sometimes developing over a period of several weeks Mirror examination of the larynx in these cases will reveal an adequate airway at the glottis but an undoubted narrowing in the subglottic area. On bronchoscopic examination the appearance is usually both that of a granulomatous mass and of actual fibrous narrowing at the level of the former tracheostomy and in the cases which have come under our observation little can be done except to re insert the tracheostomy tube and leave it in permanently

STRICTURE (ANTERIOR WEBBING) OF THE GLOTTIS FOLLOWING PARTIAL LARYNGECTOMY

Following partial laryngectomy stricture at the glottis is a comparatively rare complication. As a matter of fact unless one wing of the thyroid cartilage is partially removed the glottic opening tends to be so wide that the opposite and intact cord may not be able to approximate the healed scar on the resected side of the larynx sufficiently to permit phonation Resection of some cartilage is therefore indicated in partial laryngectomy not only to insure adequately wide excision of the growth but also to permit a better voice function in the healed state When some cartilage is removed at partial laryngectomy the surgical wound within the larynx, which must necessarily be left open tends to contract and heal in the vertical direction so that little or no narrowing of the glottis takes place Occasionally however especially when the excision extends across the anterior commissure, the scar tends to contract in the hori

zontal direction so that the caliber of the glottis is narrowed. Usually the degree of narrowing is not sufficient to be of great clinical significance, and the patient has no dyspnea except on such types of physical exertion as climbing stairs. In rare cases after extensive partial laryngectomy it may not be possible to completely remove the tracheostomy tube, and one of small caliber (#4 or #5) may have to be left in preferably with a Tucker valve in the inner cannula

Anterior Webbing. An occasional form of stricture may occur in the form of an anterior web at the level of the glottis. In these cases the glottis is narrowed, mainly in its anterior portion by what appears to be a thin web of tissue Such a complication is particularly likely to occur when through laryngofissure the surgeon elects simply to excise the vocal cords themselves for pachydermia and then, hoping to minimize the disability sutures the narrow, slit-like horizontal wounds and closes the incision without removal of cartilage The occurrence of this form of laryngeal stricture is one of the main contraindications to such, supposedly, conservative surgery

To the inexperienced, the appearance of this anterior web suggests that the stricture could be readily relieved simply by making an incision or biting out a portion of this web In the experience of my colleagues and myself at Memorial Hospital, such an attempt is futile, for the divided web immediately reunites and the stricture returns, often in more bulky form Should such anterior webbing cause serious respiratory distress the most practical solution is the reinsertion of a narrow-caliber tracheostomy tube with a Tucker valve as mentioned above

SALIVARY FISTULA—PHARYNGOSTOME

The occasional development of a small salivary fistula following such operations as neck dissection combined with total laryngectomy or excision of a lesion within the mouth should no longer be considered too serious With proper care (naso-esophageal tube feedings frequent irrigation of the tract by swallowing water large doses of antibiotics) the fistula can be expected to close within a few days or weeks and its greatest significance therefore, is the longer morbidity

Temporary Pharyngostome Wide through-and through separation of the wound edges (both skin and mucosa) sometimes occurs following such operations as total laryngectomy combined with neck dissection, especially in previously irradiated cases The result may be a pharyngostome several centimeters in diameter The prognosis is not necessarily too discouraging in these cases, for with adequate wound care the majority of the defects will heal spontaneously and close completely In a minority the pharyngostome will persist, often shrinking down to a centimeter or less, with complete epithelization of its edges At this stage, when further shrinkage can no longer be expected the opening can be closed by a rotated pedicle flap, trap door flaps or a tubed pedicle (Figs 557–564)

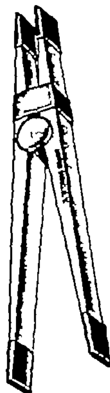
In cases of permanent or semipermanent pharyngostomes of larger calibre the parotid ducts should be ligated to reduce volume of salivary secretion and leakage The best insurance against salivary fistula of any degree in radical laryngeal or pharyngeal surgery is the meticulous closure of the mucosal edges of the pharyngeal opening and the fixation of this suture line by including in each stitch a bite of some overlying tissue such as one or more of the following strap muscles severed constrictor muscle posterior belly of the digastric, subcutaneous fat (Figs 512–513) *In addition*, once the pharynx is closed the anterior wall of the esophagus should be tacked down to the overlying soft tissues by several interrupted sutures Dependence on the Connell stitch is futile, in my opinion

TRISMUS

In operations involving the posterolateral wall of the oropharynx or the maxillae there may be exposure of the pterygoid muscles In advanced skin cancer of the posterior aspect of the cheek or ear and in cancer of the parotid the deeply invading infected growth may involve the masseter and temporal muscles Radiation therapy of posterior buccal or tonsillar cancer is often complicated by local radiation necrosis With even a moderate degree of infection the above mentioned muscles may go into static contraction and produce trismus. The compli-

cation is not nearly so common following surgery as with radionecrosis in the above mentioned areas In any event, surgery of head and neck cancer is at least *occasionally* complicated by a troublesome degree of *trismus* In radical operations of the maxillae it is often advisable to resect the anterior portion of the ascending ramus including the coronoid process thereby preventing trismus from temporal muscle spasm.

When the trismus results from radionecrosis, the only method of complete relief is by resection of the posterior portion of the mandible A mild degree of temporary trismus resulting from mouth cancer is often relieved by the use of such devices as the jaw exerciser and the jaw stretcher (Figs 76–77)



76 Jaw exerciser



77 Jaw stretcher

76 and 77 Trismus may be a complication following either surgery or radiation especially when there is infection and/or scarring in the region of the pterygoid and temporal muscles, or the temporomandibular joint. Considerable relief can be obtained if the opening of the mouth is stretched and the motion at the temporomandibular joint exercised.

CORNEAL INJURIES AND OTHER EYE COMPLICATIONS

In resection of the maxilla (Figs 433–439) or in any operation where the manipulations are near the eye it is prudent to make a preliminary temporary suture of the eyelids It is otherwise difficult to avoid trauma to the cornea and conjunctiva during such maneuvers as sponging. At the completion of the operation the sutures should be left in place for several days at least until the eye is free of the postoperative dressings

Less obvious, but equally important protection, is to make such a temporary suture of the eyelids in all cases where the immediate postoperative dressing to the face covers the eye No matter what care is taken there can be little assurance that the dressing does not come in contact with the exposed cornea before the patient awakes, and should this occur a painful corneal ulcer or conjunctivitis may result Such temporary suture through the palpebral margins may remain several days, if necessary and serve as a protection to the eye without any discomfort.

TRACHEITIS SICCA

A moist and clear mucosal lining in the trachea and major bronchi is maintained normally both by the tracheal (mucous and serous) glands and also by moistening of the inspired air by evaporation from the mucosa of the nasal cavities oral cavity and pharynx. With short circuiting of the respiratory channels this moistening action is lost and the complication known as *tracheitis sicca* most often occurs following total laryngectomy especially during the winter months Tracheitis sicca tends to develop if at all within a month following total laryngectomy The walls of the trachea become crusted with a gluey tenacious coat of partly dried mucus so as seriously to obstruct respiratory exchange Ordinary coughing is not sufficient to dislodge the crust and sometimes following convulsive efforts, an almost complete cast of the trachea will be expelled. On separation of the crust there will follow a mild oozing of blood which when mixed with drying mucus tends to form another even more tenacious crust

The complication is most likely to occur during the winter months when the relative humidity of heated air within buildings tends to be low The best treatment is prevention The room (either in the hospital or at home) occupied by a laryngectomized patient should have some artificial humidification and the breathing tube should be left out as much as possible. The apron over the tracheostomy opening should be kept moist. Active treatment should be instituted at the first sign of onset. The immediate treatment should be, first, the removal of the large crusts by an instrument such as the laryngeal biopsy forceps so as to relieve the critical obstruction Then working more leisurely the remaining crusts can be sprayed with a deter gent solution of 1% Dupinol and gently manipulated and dislodged. A new substance—*pancreatic dornase* (desoxyribose nuclease)—ha become available for the prevention and treatment of tracheitis sicca. The substance is a highly active fibrinolytic enzyme It is usuall supplied in bottles containing 100 000 units t be dissolved in 2–5 cc. of diluent and injecte or sprayed into the trachea and bronchi throug the tracheostome The treatments are repeate daily or even more often until the complicatio is relieved. In addition high humidification o the room air should be maintained by som form of mechanical humidifier preferably a device which produces cold steam For this purpose the patient with tracheitis sicca should b placed in a small single room rather than in a open ward An expectorant such as potassium iodide should be used. This complication sometimes persists in a varying degree for severa weeks

MICROSTOMIA FOLLOWING TOTAL LARYNGECTOMY

One of the troublesome complications following total laryngectomy was formerly constriction of the stoma by scar tissue at the skin level, so that without a permanent tracheal cannula there was serious impairment of respiratory exchange In recent years, with a better understanding of the mechanics of wound closure following laryngectomy microstomia should seldom occur—probably in less than 5 per cent of cases and then only because of some difficulty in wound healing

There are several causative factors in the development of a constricted stoma. Beginning a the time of operation, a prominent thyroid lobe constrictive pressure of the overlapped sternohyoid muscles, a transverse rather than a obliquely severed trachea, and an undersize skin opening may all combine to result in tracheal stoma of inadequate size * These factor can be eliminated by resecting one lobe of a prominent and adenomatous thyroid severin the sternohyoid muscles opposite the stoma, ex

* With a proper follow-up, microstomia should never be permitted to progress to the point of seriou respiratory obstruction, but I have had 2 cases of patients operated upon elsewhere who arrived at my offic in a serious degree of chronic asphyxia and cyanosis. In one of these the cricoid cartilage had been preserve for the purpose of preventing just this complication. In both cases the stoma had shrunk down to about 3 mm in diameter Both patients were men of about 170 to 180 pounds in weight, and it seemed remarkable to m that they had been able to survive on such a minimal volume of respiratory exchange with even moderate physical activity In such cases the remedy is to dilate the opening by any tapered or wedge-shaped object whic may be at hand and then to insert a tracheostomy tube. In an emergency a uterine dilator (Hegar or Hank will serve fairly well



78 Tracheal stoma dilators. Although total laryngectomy by modern technics is not often followed by constriction of the tracheal stoma, nevertheless this complication will occur in a small percentage of cases as the result of technical difficulties during the operation, associated with previous radiation, marked extension of the growth into the subglottic area, etc. In the ideal situation the patient should not require a breathing cannula after healing has taken place An attempt should be made gradually to dilate the stoma and to insert and wear for an hour or two daily an increasingly larger breathing cannula until the stoma ceases to constrict. The graduated set of dilators shown is useful for this purpose In some cases the patient will need only one of the larger sizes for dilation once a day for an indefinite period.

cising a generous ovoid segment of skin (1.5 × 3 cm) and cutting the end of the trachea on a bevel rather than directly transversely Accurate approximation of the skin edges to the tracheal mucosa by multiple 20–25 fine sutures will assist in reducing scar tissue formation at the juncture All of these points of technic are illustrated in Figs 504–506 In cases of wound breakdown the skin-tracheal edges may also separate, and when this happens the resultant healing by secondary intention and scarring tends to cause stricture

In some cases the difficulty can be overcome fairly successfully by using a tracheal cannula (laryngectomy tube) In any clinic or office where postlaryngectomy patients are followed it is useful to have a graduated set of dilators, such as that illustrated in Fig. 78 With this nested set the stoma may be gradually dilated up to a caliber adequate to the patient's weight and respiratory needs Bouginage may be employed to assist in the gradual dilatation of moderate degrees of constriction Some patients are able to maintain a stoma of adequate size by daily bouginage with a single dilator of a selected diameter

In some patients with only moderate narrowing of the tracheal stoma the most practical solution is the wearing of a laryngectomy tube during the most active period of the day when the physical effort is the greatest In these only the outer cannula need be worn dispensing with the inner cannula—a minor nuisance which tends to narrow the effective caliber of the air way

INFLAMMATORY AND TRAUMATIC HYPERTROPHY OF THE TAIL OF THE PAROTID FOLLOWING NECK DISSECTION

In a small but nevertheless significant percentage of neck dissections there will develop within a few weeks an ill-defined swelling over the region of the tail of the parotid, which naturally raises the question of recurrent cancer which it markedly resembles Obviously in some such cases there is actual recurrence but in a fair proportion the swelling is caused by inflammation in the traumatized residual portion of the partly resected tail of the parotid and possibly in too long a residual amputated stump of sternomastoid muscle The importance of good clinical judgment and diagnosis is obvious In the first place if the complication should actually be benign the patient may undergo a period of unnecessary anxiety and suffering and the surgeon may be led imprudently to administer radiation therapy without histologic proof of recurrence the effects of which will only tend to increase the local induration and to confirm the erroneous suspicion of cancer For the last several years in every such case where aspiration biopsy failed to furnish positive evidence of recurrent cancer I have resected the local tissues and in several instances have found no histologic evidence of cancer a solution which afforded welcome relief to all concerned This complication has been of

such specific significance to me and some of my associates that it has been assigned the eponym of one particular patient—*the Rosenkrantz syndrome*

KELOID

Much has been written about the etiology, prevention and treatment of keloid. It must suffice here to deal only with the more practical aspects of this lesion—one of the most annoying though nonlethal complications of head and neck surgery and which has been aptly termed the *bugbear of the plastic surgeon* Briefly considered, keloid is more common to though by no means limited to wounds which fail to heal by prompt primary intention. Its incidence can be reduced but not entirely eliminated by accurate approximation and suture of the skin incisions It occurs mainly on the lower face anterior neck (thyroid operations) and sternal area in the beardless skin of women and children. Negro women are particularly susceptible When keloid develops in the scar of total laryngectomy it almost always results in microstomia

Keloid can occur not only in surgical incisions but in a wide variety of superficial wounds almost anywhere about the body ranging from extensive burns down to a tiny accidental prick of a brooch pin over the sternal area It can occur also in heavily bearded facial skin of adult males A variant sometimes appears in full thickness or thick split skin grafts when a few days after an apparent perfect take the graft becomes raised and of a deep red color

The Treatment of Keloid Surgical excision is worse than futile in almost all cases since it almost invariably results in prompt recurrence of even greater extent and bulk This is true also of Z-plasty when applied to palliate the pull of a contracted band of the scar

Radiation therapy in any justifiable dose is at best only mildly effective in reducing the bulk of the lesion and even so such late effects of radiation as pigmentation atrophy of subcutaneous fat, radiation sclerosis and telangiectasis only tend to worsen the cosmetic appearance Many radiation skin cancers have developed in keloids so treated

In my opinion the only justifiable form of treatment for keloid is freezing by carbon dioxide snow Once the lesion has developed prompt treatment is essential in order to be at all effective. The older keloids (several months or more) are seldom responsive to any form of therapy The head and neck surgeon should be alert for the early discovery of this complication, especially after thyroid operations in females and after facial incisions in children The experienced will be loath to operate on the face or neck of a child if the procedure can be deferred reasonably safely The surgeon should be able to recognize the earliest and slightest tendency toward keloid and then with a reasonable suspicion of its possibility begin immediate treatment. After considerable experience with the other methods above-mentioned I feel certain that the application of carbon dioxide snow not only is by far the most efficacious method but (what is equally important) even in the most resistant cases nevertheless is completely harmless

Solidly-packed carbon dioxide snow or "dry ice" is widely available in confectionary stores and other establishments concerned with cold preservation of food It can also be made in the office or clinic by a device which utilizes a cartridge of CO_2 From a larger block a thin slab wedge or other shape is sawed and shaped by pressure so as to exactly fit and cover a part or the whole of the keloidal surface The ice is pressed rather firmly into the lesion and held for 15–30 seconds or long enough to produce a depressed solidly-frozen white patch The patient is informed that a reaction will appear possibly in the form of a thin blister which should be protected from breakage if possible The reaction will dry up in a day or two and disappear completely within 10–14 days The application then should be repeated at about monthly intervals and continued for 4–12 months, especially if there seem to be encouraging signs of diminution in bulk and color If there is no response after 3–4 applications one might as well discontinue the effort

In full-thickness skin grafts about the face, the development of a deep red color with moderate elevation of the surfaces calls for the same treatment and in most cases the response is prompt and gratifying.

Chapter 7

LONG-TERM COSMETIC AND FUNCTIONAL DISABILITIES FOLLOWING RADICAL SURGERY OF THE HEAD AND NECK

The cure of cancer whether by surgery or radiation frequently can be accomplished only after a sacrifice of time and money and considerable suffering. Following the immediate recovery from such necessarily aggressive treatment there may be various forms of permanent disability including deformities in appearance altered speech or even loss of speech by natural means Less often there may be loss of one eye of ability to masticate food, and sometimes of the ability to swallow by natural means an adequate amount of nourishment Similar degrees of disability may be inevitable in the cure of cancer of other parts of the body—the loss of a limb permanent colostomy ureterostomy etc

Inexperienced observers on first coming into contact with a patient who has undergone such sacrifices are frequently heard to remark "It isn t worthwhile—I would rather be dead than in such a condition" Such intemperate arbitrary statements are rarely based on clear thinking or actual facts. While except on religious or moral grounds it might be unfair to criticize the resort to suicide as a solution for those who know themselves to be afflicted with a hopeless painful disease it is hardly reasonable nevertheless that a patient emotionally unable to face the prospects of radical surgery should impulsively choose death from untreated cancer as the alternative Furthermore it is hardly reasonable to hold that a person in robust health is competent to decide on the spur of the moment that death by suicide or cancer would be preferable to life with certain handicaps Surgeons, particularly those who have had long experience in the treatment of cancer have ample evidence of the overpowering desire to *live which is manifested by most patients under* the most trying circumstances of discomfort and disability Such handicaps are borne with surprising equanimity (pathophilia) if the patient has at least some hope of surviving

COSMETIC APPEARANCE

Major operations on the lower part of the face may cause marked changes in the contour Most patients and their families soon become accustomed to this altered appearance even though the blemish is of such a degree as to make the wearing of some covering or mask necessary Such patients seldom become recluses because of their appearance and almost always resume their former associations and contacts A defect as large as 8 to 10 cm in diameter including an eye and a considerable portion of the cheek can be covered with a fitted muslin dressing held in place by liquid adhesive The resulting appearance is acceptable to almost everyone The loss of one eye alone covered by a black patch is even con

sidered a distinction in many persons of prominence The loss of the nose is perhaps the most serious blemish but even here prostheses or various forms of covering will serve to minimize the handicap so that at least the family and friends soon become accustomed to it.

In most such cases it will be found that an *honest covering of a defect is preferable to a* counterfeit such as an orbital defect covered by a glass eye with simulated lids and eyelashes of plastic, or an artificial and colored nose or ear Paradoxically the closer such counterfeits approach the normal in appearance the more objectionable they are A curious feeling of repulsion is observed when a person first discovers that what he at first thought was a normal nose or eyelids is actually not living flesh Even if the repulsive effect is not so great, the *reaction of the* average observer is somewhat similar to that felt when a luxuriant head of hair on a handsome man is discovered to be a wig

DISABILITY AND PARESTHESIAS FOLLOWING NECK DISSECTION DUE TO *SECTION OF THE ELEVENTH CRANIAL NERVE AND CERVICAL PLEXUS*

An effectively complete removal of those portions of the cervical lymphatics most likely to be involved by metastatic cancer in neck dissection necessitates the resection of the spinal accessory nerve and the cervical plexus The most significant disability that follows neck dissection is a paralysis of the trapezius and a *resultant shoulder drop associated with some re*duction in the usefulness of the arm especially when an attempt is made to raise it above the shoulder level as when putting on a coat There is a characteristic alteration in the configuration of the shoulder and in some cases a loss of the ability to abduct the arm completely *Flexion is much less affected and by bringing* the arm up anteriorly the majority of patients can compensate adequately for loss of movement in a lateral direction Following neck dissection, however a *high percentage of patients* continue without difficulty to earn their living as before The disability that follows bilateral radical neck dissection is surprisingly slight and it is possible for some patients to resume even hard manual work *

During the removal of the cervical plexus the cervical nerves (second third and fourth) are sectioned at their emergence anterior to the *scalenius medius and levator scapulae muscles* Removal of the cervical plexus results in anesthesia of the skin of the lateral aspect of the neck ear and parotid area the clavicular region and shoulder Associated paresthesias cause more discomfort at the beginning than at a later date when the patient has become accustomed to *them On rare occasions amputation neuromas* develop at the site of the amputated nerve stumps in the cervical roots causing such acute discomfort in the localized "trigger" area that *an operation may be indicated resecting* a neuroma and injecting the stump with alcohol

TISSUE DEFECTS OF THE MOUTH PRODUCING SALIVARY INCONTINENCE

One of the most troublesome disabilities is a wide permanent or semipermanent opening into the oral cavity—usually in the lower part of the cheeks or upper neck—that results in contant out-pouring of salivary secretions which must be caught by frequently changed bulky dressings. In most such cases the defects can eventually be closed by reconstructive surgery either by approximation of the edges of the defect or by pedicle tubes migrated from adjacent areas. Occasionally however such *defects* may be so wide (consisting of the loss of the whole tongue mandible and larynx) that although the patient may survive indefinitely the defect cannot be closed from the practical standpoint Even if the submaxillary salivary glands have been removed the parotids continue to drain copiously Despite these irreparable defects and the constant annoyance of the discharge patients have lived happy useful lives for a number of years, freely admitting that they *found life worthwhile despite their handicaps*

* A patient upon whom I made a bilateral neck dissection several years ago was questioned two years later as to the extent of his disability incident to the *operation He stated that he had resumed his hobby of golf* a few months after the operation He had played a rather consistent game of between 80 and 85 prior to the bilateral neck dissection and said his score had continued at about the same level, but since the operation a previously troublesome slice had disappeared Now several years later he continues to play regularly without the slice

In selected cases consideration may be given to ligation with wire of the parotid ducts in order to lessen the amount of saliva (Fig 113)

DYSPHAGIA AND MASTICATORY DIFFICULTIES

Although swallowing is often affected during the period immediately after radical surgery of the head and neck this disability seldom becomes permanent. Occasionally however the patient may have to take supplementary feedings indefinitely by naso-esophageal feeding tubes. In others the only recourse after excising the growth is to leave a temporary or permanent esophagostome for the administration of liquid feedings In this author s experience several patients have lived apparently fairly happy lives with irreparable defects including esophagostome openings in the neck

SPEECH DISABILITIES

Following total laryngectomy there is, of course a total loss of speech by natural means, and it is the responsibility of the surgeon to reassure the patient and family preoperatively that a useful artificial voice may be obtained by one or other of several methods Some surgeons place considerable stress upon a detailed preoperative description of the whole problem to the patient This should include a serious effort on the part of the patient to learn to belch in the days preceding the operation for the purpose of achieving an esophageal voice earlier From my personal experience I question that such a policy can be justified psychologically in most patients In the majority of subjects for total laryngectomy the acceptance of the operation with the implication that the larynx will be completely removed and the voice lost, is about all the psychologic trauma that can be reasonably borne To insist upon learning to belch would, in my opinion tend only to heighten the apprehension of the operation itself Some well-balanced persons may benefit by a casual introduction to a laryngectomee who has a good esophageal voice Such a meeting can consist of a telephone conversation and often does a great deal to encourage a prospective laryngectomee

Some patients however are entirely incapable of an objective appraisal of the situation and such an encounter before the operation would only cause increased anxiety

Despite excellent preoperative psychologic preparation there will sometimes be considerable anxiety and depression when the patient on awakening from the anesthetic finds himself unable to speak and breathing through the tracheostomy opening rather than through the mouth and nose This emotional state may last for several days and much can be done to counteract it through skillful handling of the problem by the nurse the family and the surgeon and his associates The speech disability should be accepted by all concerned as a natural consequence of the treatment rather than as an overwhelming tragedy of a permanent nature, and whenever the question is raised full confidence should be expressed that voice and speech will soon be regained

Speech Re-education If possible arrangements should be made within a few days after the operation for a speech instructor preferably himself a laryngectomee to visit the patient and discuss plans for future instruction. Much is gained if the patient is confident that, as soon as wound healing permits he may begin instruction to regain his voice and speech

There are at least three practical methods of producing voice following laryngectomy which vary in the degree of their functional desirability and usefulness to the individual

The Reed Larynx. One method is through the use of the reed larynx This device consists of a metal chamber containing a reed To one end of the chamber is attached a rubber tube with a bell-shaped flange which is held against the tracheal stoma To the other end of the metal chamber is attached another rubber tube which is inserted into the mouth Air from the lungs is conducted through the metal chamber setting the reed into vibration producing sound which is led through the second rubber tube into the mouth where it is then articulated to form speech

The Electro-larynx. A second device for producing an artificial voice is the Electro-larynx This device powered by a pocket battery consists essentially *of a buzzing mechanism which* when pressed against the side of the neck produces a sound that is transmitted through the

soft tissues of the neck into the pharynx and oral cavity there to be articulated into speech As with the reed larynx, the use of the Electrolarynx can be learned in about half an hour However the instrument when in use produces a constant buzzing sound objectionable to many people The original cost and maintenance of the apparatus is also rather high

Esophageal Voice Undoubtedly the method of producing an artificial voice that is most useful and best suited to the majority of patients is the esophageal method, *if it can be acquired*

Too often, the mechanism of esophageal voice has been presented to the patient, and to the public, clothed in an air of mystery compounded by the use of complicated and obscure verbiage As a matter of fact esophageal voice differs from normal voice mainly in the anatomic structures which are involved The basic form of the mechanism is the same a column of air is made to pass from a reservoir through a relatively narrow aperture the edges of which, being in contact are made to vibrate and thereby to produce sound the sound enters the mouth where it is articulated by the tongue lips and teeth to produce speech In normal speech, the air from the reservoir (in this case the lungs and the bronchial tree) passes by way of the trachea through the narrow aperture of the glottis (vocal cords) After total laryngectomy the reservoir of air for voice production is in the esophagus (rarely the stomach) On being expelled or eructated upward, this column of air produces a vibration of soft tissues surrounding a relatively narrow aperture at about the level of the circopharyngeus or in some cases, at a higher level in the hypopharynx A sound is produced which is identical with a belch in the normal person * It is this sound which is articulated to produce speech.

Some laryngectomees acquire an esophageal voice without any outside instruction by accidentally discovering first that they can produce the sound of an ordinary belch and, then that they can articulate this sound to produce words (Not long after the first laryngectomy was performed by Billroth about seventy five years ago the phenomenon of esophageal voice was discovered by a patient and reported by his surgeon in the medical literature) Nevertheless in the case of most patients, organized instruction is advisable otherwise the acquisition of a voice by one or the other method may be long delayed or may never occur

The instructor himself should be a laryngectomee whose special talents consist not only of an excellent esophageal voice which may be used as a standard, but also of the ability to inspire confidence that by persistent effort the laryngectomee can again acquire a voice and return to a normal gainful mode of living In most large cities where laryngectomies are performed in fair numbers, there are organized classes in nonprofit institutions where such instruction is given The laryngectomee should register with such a group as soon as possible after the operation If the patient or his physician does not know of any organized group for speech training, he may get such information by calling the nearest office of the American Cancer Society or by writing the Professional Service Section Medical and Scientific Division, American Cancer Society 521 West 57th Street, New York 19 N Y In the New York area the patient may call the National Hospital for Speech Disorders, 61 Irving Place, New York 3, N Y

* For the reason that it is considered somewhat inelegant, some esophageal voice instructors object to the use of the term "belch" to define the basic character and the origin of the sound in esophageal voice. In dictionaries "belch" is defined as "to eject air or gas from the stomach through the mouth." Except that the ejected air does not always come from as far down as the stomach, this is actually the essential mechanism of esophageal voice. While the sound of the belch may be considered socially objectionable in a healthy person, the laryngectomee is indeed fortunate if he can produce a voluntary belch, without which esophageal voice is impossible.

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Part 2

ATLAS OF OPERATIVE PROCEDURES

Chapter 8

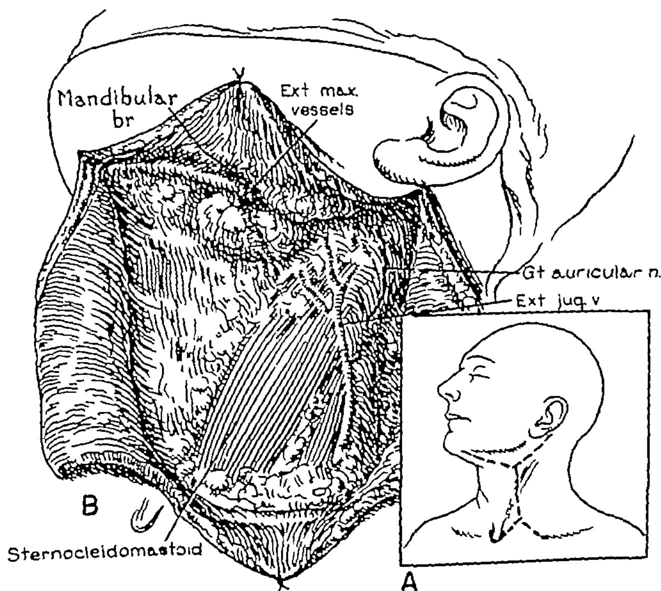
OPERATIVE PROCEDURES OF A GENERAL CHARACTER OR APPLICATION

NECK DISSECTION

The purpose of this operation is to remove all cervical lymphatics from the lower edge of the mandible to the clavicle and from the anterior border of the trapezius to the midline of the neck from the undersurface of the platysma muscle (and to the same depth beyond the borders of this muscle) to the fascia overlying the deep musculature of the neck The procedure routinely includes the excision of the sternomastoid muscle the accessory nerve, the internal jugular vein and the submaxillary salivary gland

DISSECTION

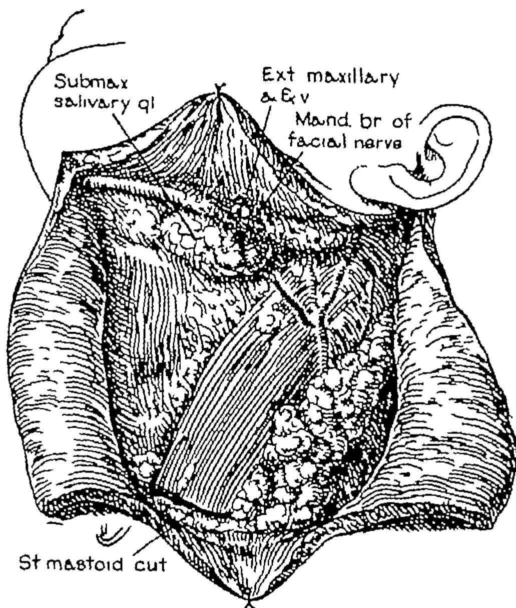
The most useful form of incision for neck dis-section is the double Y (double trifurcate) with ider extensions above than below The line of dis ction follows the undersurface of the platysma and beyond the border of this muscle at about the same level The margins of the operative field are the lower edge of the mandible above the midline the neck in front, the anterior border of the trapezius muscle posteriorly and the clavicle below



79 Incision and superficial skin flaps.

NECK DISSECTION CONTINUED

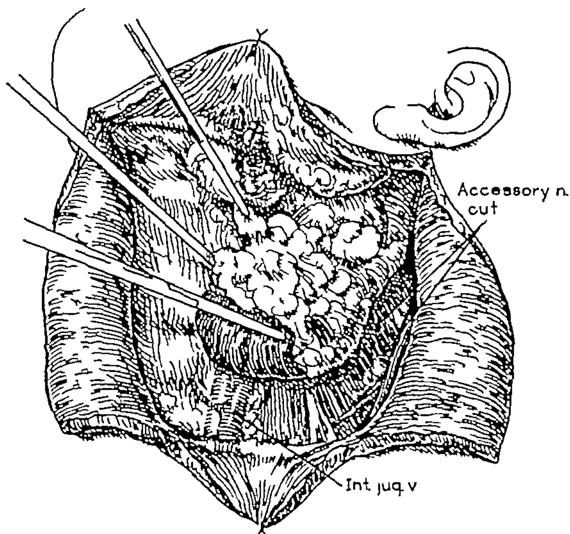
80 The lowermost facial branch of the 7th cranial nerve (*N marginalis mandibulae*) lies just superficial to the external maxillary artery and facial vein at about the lower edge of the mandible Unless precautions are taken to preserve this structure, it frequently will be cut and unilateral paralysis of the homologous half of the lower lip will result The sternomastoid muscle is cut just above the level of the clavicle



80 Beginning the dissection.

NECK DISSECTION CONTINUED

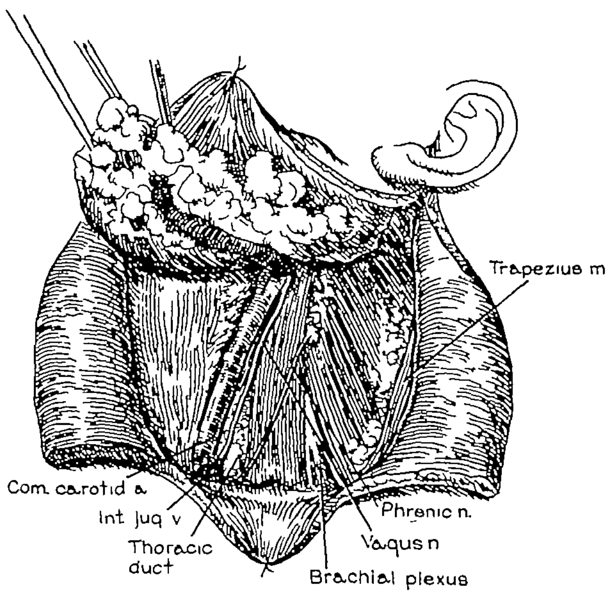
81 After the sternomastoid muscle has been cut across, just above the level of the clavicle the dissection then begins posteriorly severing the posterior belly of the omohyoid muscle



81 Section of the lower end of the internal jugular vein

NECK DISSECTION CONTINUED

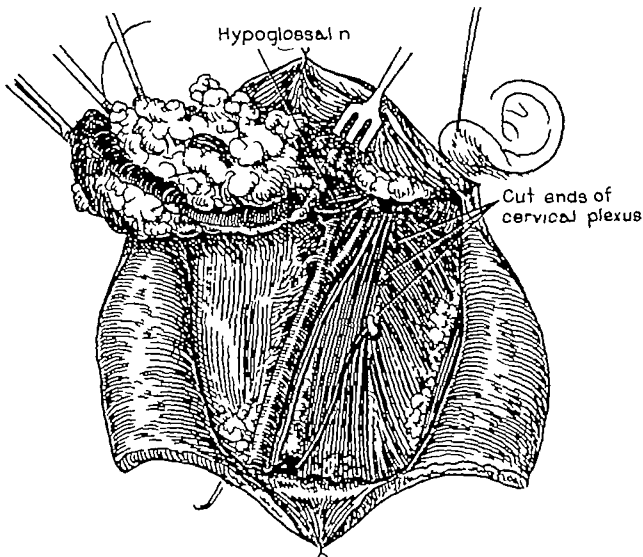
82 The dissection is carried down to the deep muscles of the neck (scalenae) severing the internal jugular vein just above the clavicle Care should be taken to avoid injury to the phrenic nerve and, if the dissection is on the left side the thoracic duct. The deep level of the dissection is the fascia overlying the strap and prevertebral muscles (third layer of deep cervical fascia) The 11th cranial nerve is sectioned at about the anterior border of the trapezius muscle The common carotid artery the vagus and phrenic nerves and the trunks of the brachial plexus are exposed



82 Clearing the lower neck.

NECK DISSECTION *CONTINUED*

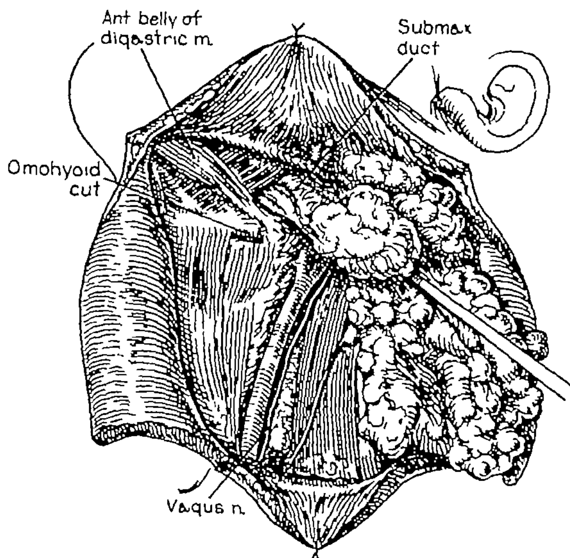
83A The sternomastoid muscle is cut close to the mastoid process, the landmark being the posterior belly of the digastric muscle which when retracted upward exposes the internal jugular vein for clamping and sectioning as high as possible The 11th cranial nerve is again sectioned The hypoglossal nerve is observed coursing downward and forward



83A Severing the upper end of the sternomastoid muscle

NECK DISSECTION CONTINUED

83B Dissection is then begun in the submental ~ a little beyond the midline exposing the anterio belly of the digastric muscle and the myelohyoid mus cle whose posterior edge is retracted, exposing th submaxillary duct (which is sectioned) and th lingual branch of the 5th nerve (which is preserved)

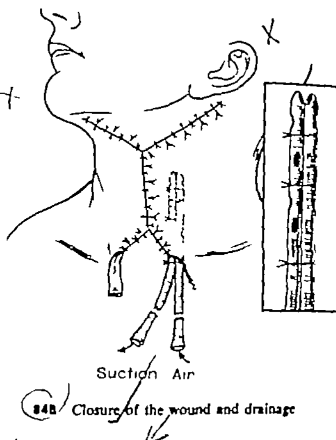


83B Clearing the submaxillary triangle

NECK DISSECTION CONTINUED

84A In the completed neck dissection all lymph node–bearing tissue between the undersurface of the platysma and the third layer of the deep cervical fascia has been removed preserving only certain vital structures which include from above downward the *ramus marginalis mandibulae* of the 7th nerve the lingual, hypoglossal vagus and phrenic nerves, the brachial plexus and the common and internal carotid arteries The external carotid artery may be sacrificed if necessary

84B A Penrose rubber drain is laid along the course of the common carotid artery and brought out through the anterior arm of the lower Y A double catheter for sump-suction drainage may be placed in the posterior arm of the lower Y



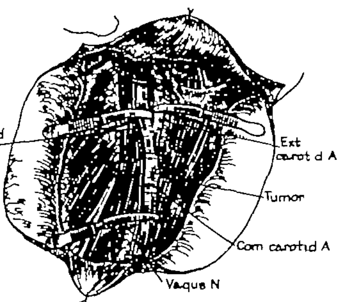
84B Closure of the wound and drainage

Branch to submax gl cut
Parotid gl
Hypoglossal n
Ext carotid a
Int carotid a
Com carotid a

NECK DISSECTION CONTINUED

Segmental Excision of the Common Carotid Artery and End-to-End Anastomosis

When there is invasion by cancer of the midportion or of the bulb of the common carotid artery a segment up to at least 4 cm of artery can be resected and anastomosed For safety s sake it is essential that the blood pressure be maintained at its habitual level throughout the maneuver and that the bulldog clamps momentarily be released (every minute or two) to permit expulsion of any clot After excision of the arterial segment the stumps of the arteries above and below can be stretched to permit their approximation The internal carotid artery, having no branches in the neck can be stretched considerably and pulled downward from 2 to 4 cm provided that the external carotid artery is sectioned to release the relative fixation by the lingual and external maxillary arteries This maneuver becomes increasingly difficult or impossible if the arterial invasion extends too high along the internal carotid artery

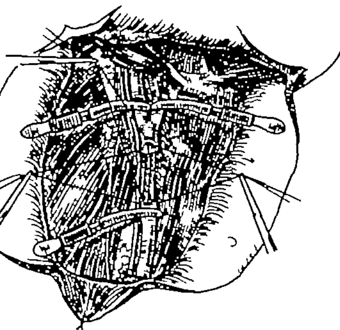


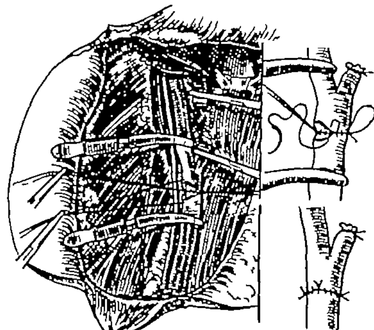
Placement of bulldog artery clamps prior to segtal excision of the common carotid artery

85A On the completion of a neck dissection, a tumor has been found to invade the wall of the common carotid artery at about its midpoint Bulldog clamps have been placed (three on the arteries) and the dotted lines indicate the level and the site of the intended segmental excision

85B A segment of the midportion of the common carotid artery has been excised and stay sutures of 5–0 arterial silk have been placed At this stage and until the anastomosis has been completed, the clamps are occasionally released to permit washing out of any blood clots

85C The external carotid artery has been sectioned to facilitate the stretching downward of the internal carotid so as to approximate the ends of the common carotid The stump of the external carotid artery is ligated and the arterial anastomosis completed.





Excision of the involved artery and placement of

85C Anast

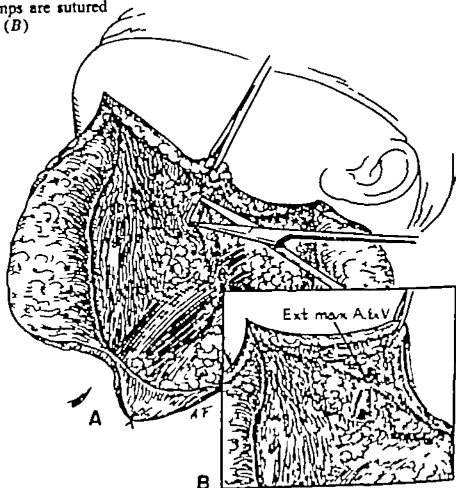
NECK DISSECTION CONTINUED

Maneuver to Avoid Inadvertent Injury to the Marginalis Mandibulae Nerve During Neck Dissection

The marginalis mandibulae branch of the seventh cranial nerve (a branch of the cervical facial division) curves downward and forward crosses superficial to the external maxillary vessels at about the lower edge of the mandible and then curves upward and forward in the direction of the angle of the mouth The lowest point of its downward curve lies directly over the external maxillary vessels either above or below the lower edge of the mandible The risk of accidental trauma to this nerve branch during *neck dissection can best be avoided by directly* exposing one of the external maxillary vessels well below the lower edge of the mandible, then sectioning such vessel (usually a vein) and proceeding to dissect upward along its deep surface By this maneuver the marginalis nerve is pulled upward out of harm s way within the loop of the vessel Finally when the artery itself has been located and sectioned the distal stumps of these vessels are ligated and sutured to the undersurface of the upper flap From this point onward the nerve will be well protected and is *not subject to further injury*

86 Before the upper flap of the double trifurcate incision is completely raised to the edge of the man dible one of the external maxillary vessels (either artery or vein) is exposed by blunt dissection at least 1 cm or more below the lower edge of the mandible (*A*)

The upper flap is then dissected back along the deep surface of this vessel when the artery is finally located and sectioned the distal stumps are sutured to the undersurface of the upper flap (*B*)



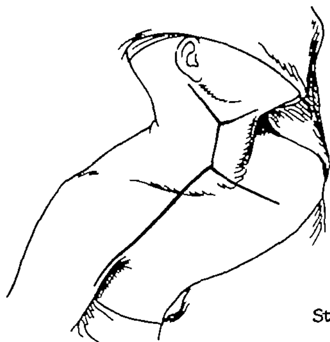
86 Protection of the mandibularis nerve by a loop of the distal end of the external maxillary vessels.

Combination Neck Dissection and Axillary Dissection

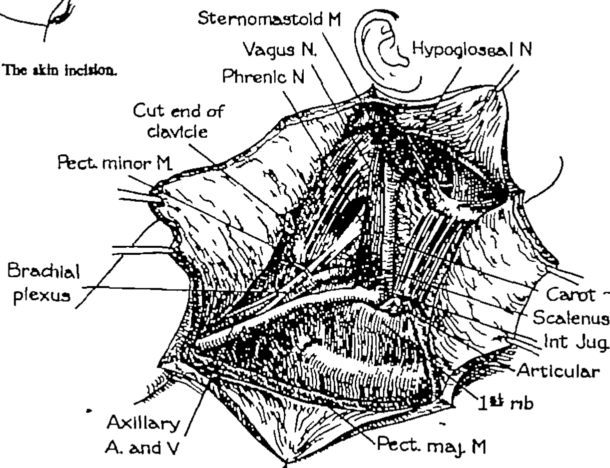
The removal of the lymphatics of the neck and axilla at the same operation is most often called for as an extension of radical amputation of the breast A combination of neck dissection and axillary dissection is sometimes performed as a separate operation.

87 A standard double Y incision for neck is extended down over the upper sternal region, do along the anterior axillary fold and on to the arm.

88 The area of the neck dissection is exten downward and laterally by resecting the inner t thirds of the clavicle It is often advantageous sever the clavicle short of its inner end, leaving sternoclavicular joint intact The pectoralis major a minor and subclavius muscles are resected the axillary muscles and nerves The axilla is cleared of its other contents



87 The skin incision.



88 The completed operation

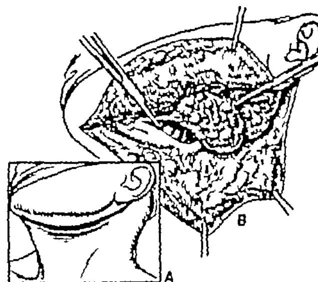
EXCISION OF SUBMAXILLARY SALIVARY GLAND (SUBMAXILLARY DISSECTION)

By reason of its limited scope, submaxillary dissection is practically never indicated or justified in the treatment of cancer Its main usefulness is for the excision of the submaxillary salivary gland in cases of benign mixed tumors or salivary calculus.

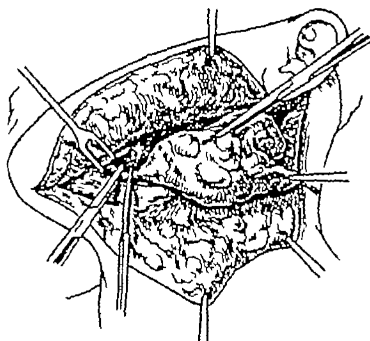
89 A curved horizontal incision is made and carried down directly to the submaxillary gland The external maxillary vessels are isolated, clamped, and cut care being taken to preserve the mandibular branch of the 7th nerve.

90 The submaxillary salivary gland is mobilized, the submaxillary duct clamped and cut, and the gland removed.

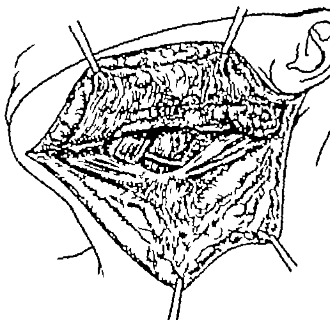
91 In the completed operation the lingual branch of the 5th cranial nerve is seen just under the edge of the mandible The 12th nerve is usually not directly exposed.



89 Position of the incision and development of the skin flaps.



90 Mobilization of the gland.

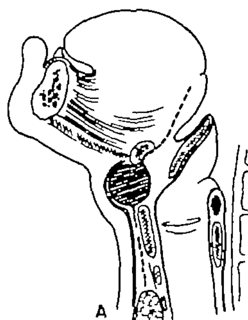


91 The appearance of the operative field following removal of the gland.

EXCISION OF CONGENITAL CERVICAL CYSTS AND FISTULAE

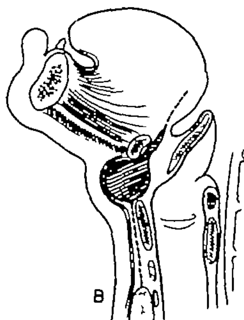
Excision of Thyroglossal Duct Cyst

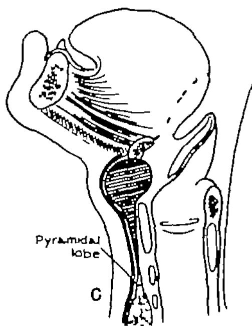
Unless the central portion of the hyoid bone is excised, either recurrence of the cyst itself or a draining sinus is to be expected following incomplete removal of the vestigial tract of the thyroglossal duct.



92 Thyroglossal duct cysts present in or near midline of the neck either directly over or just ⌞ ⌟ (less often above) the level of the hyoid bone T vestigial tract may run either below the level of hyoid bone (*A* and *B*) or directly through the yc bone (*C*) Embryologically the tract connects ᵇ with the pyramidal lobe of the thyroid. The ı portion has usually disappeared in the adult. It occasionally persist as an open prolongation of cyst downward to connect with the pyramidal

In the excision of thyroglossal duct cysts, it is necessary (as advised by some) to enter the mı and to remove a portion of the base of the If following the operation a remnant of the vestigı tract remains in connection with the base of tongue it will continue to drain harmlessly into mouth





92 Surgical anatomy of thyroglossal duct cyst

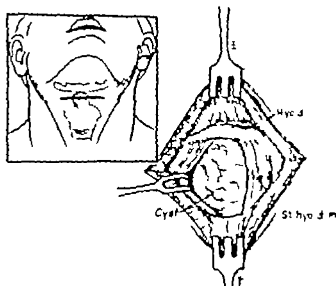
EXCISION OF CONGENITAL CERVICAL CYSTS AND FISTULAE CONTINUED

Excision of Thyroglossal Duct Cyst continued

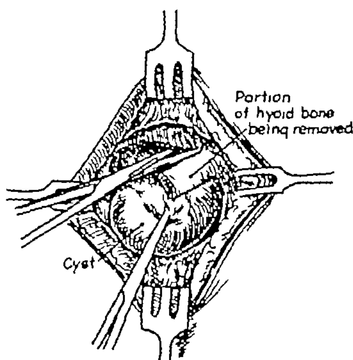
93 A horizontal skin incision is made just below the level of the hyoid bone. As the dissection approaches the infrahyoid muscles the wall of the cystic tumor is usually encountered and the sternohyoid muscles can be separated to more widely expose the cyst. The sternohyoid muscles are then detached from the midportion of the hyoid.

94 By the use of bone-cutting forceps, the midportion of the hyoid bone is resected. The hyoglossal muscles are detached.

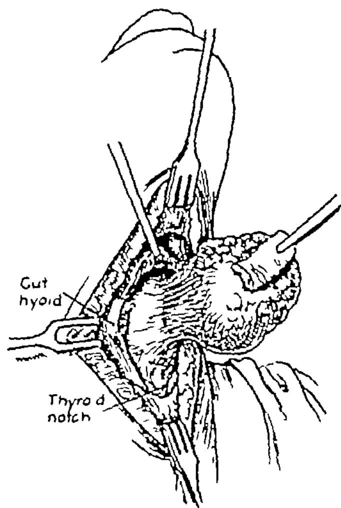
95 The resected portion of the hyoid bone is left attached to the cyst, whose wall is then carefully followed upward into the substance of the tongue.

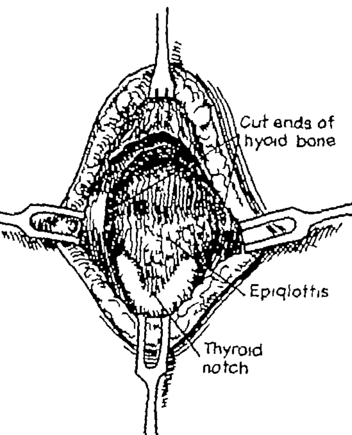


93 The skin incision and superficial exposure of the cyst.



94 Resection of the midportion of the hyoid bone.



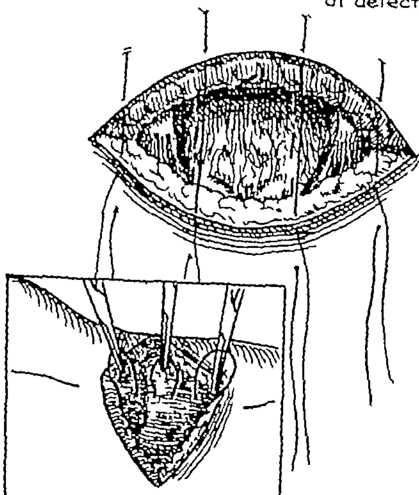


96 Operative field following removal of the cyst

EXCISION OF CONGENITAL CERVICAL CYSTS AND FISTULAE CONTINUED

Excision of Thyroglossal Duct Cyst continued

97 The incision is closed by a composite purse string suture taking repeated bites of the walls of th wound cavity By this means the dead space is elimi nated and the accumulation of blood and serum pre vented





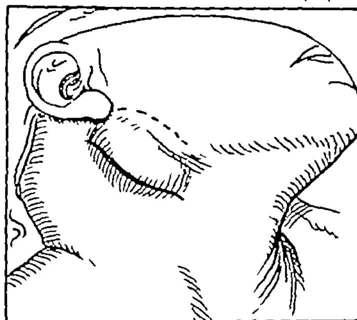
EXCISION OF CONGENITAL CERVICAL CYSTS AND FISTULAE CONTINUED

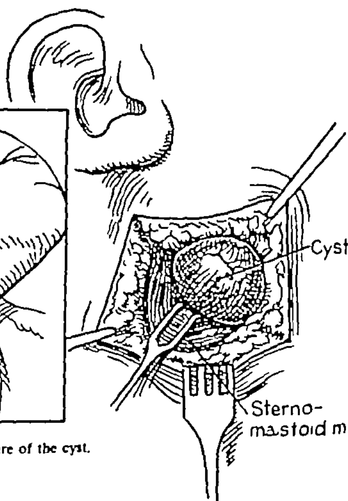
Excision of Branchiogenic Cyst

Branchiogenic cysts are most likely to occur a little above the level of the hyoid bone and to lie just beneath the anterior edge of the sternomastoid muscle.

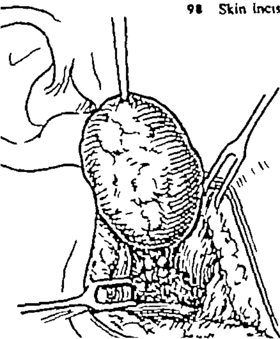
98 The skin incision should be made obliquely and in the line of a wrinkle then deepened to expose the anterior border of the sternomastoid muscle which is retracted posteriorly

99 The borders of the cyst are followed by a combination of sharp and blunt dissection Care is taken not to puncture the wall of the cyst.





98 Skin incision and exposure of the cyst.



EXCISION OF CONGENITAL CERVICAL CYSTS AND FISTULAE CONTINUED

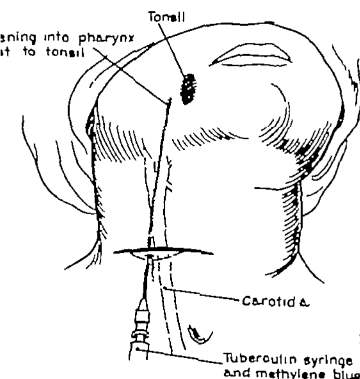
Excision of Branchiogenic Fistula

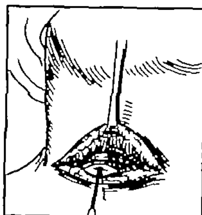
Branchiogenic fistulae usually appear in the middle or lower lateral aspects of the neck, sometimes bilaterally Injection with a solution of methylene blue is frequently followed by the appearance of the dye in the pharynx near the tonsil.

100 The external opening of the sinus is with methylene blue using a blunt needle When dye appears in the pharynx the entire tract has stained.

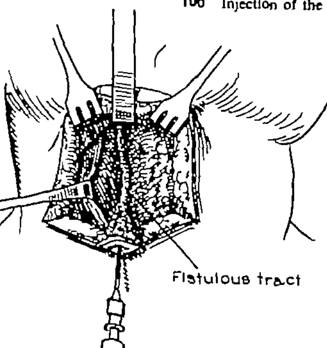
101 The upper edge of the flap is mobilized, posing the stained duct which is followed up the tissues of the neck.

102 After the tract has been dissected free to level of the mandible, it is clamped as high as p sible and the stump ligated and excised. The ing portion of the tract entering the pharynx is in place

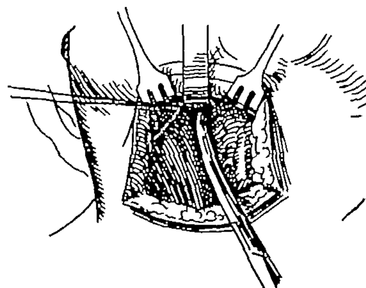




100 Injection of the duct and preliminary exposure.



101 Exposure of the fistulous tract.



102 Removal of the fistulous tract.

TRACHEOSTOMY

Tracheostomy is useful only when the obstruction to the airway is at the glottis or above or in the upper trachea When the obstruction is below the level of the glottis a longer cannula than the standard tracheostomy tube may be required. When the respiratory obstruction is acute or when chronic dyspnea has produced serious anoxia, the emergency may be so great as to call for immediate opening of the trachea with whatever surgical instruments may be available *and life will be saved if the opening* can be maintained temporarily until a regular tracheal cannula can be obtained and inserted

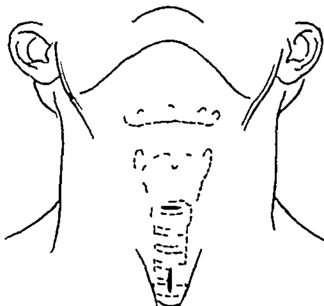
A sterile emergency tracheostomy set (see Appendix A) should be kept packaged and should be readily available on each ward or floor for contingencies when there may be no time to take the patient to the operating room. Only local anesthesia should be used or in a dire emergency all anesthesia may be omitted.

When the procedure can be deliberately performed, the opening into the trachea should be made at a lower level than the skin incision so that the tract can accommodate the downward curve of the cannula. In many clinics the *tracheostomy tube inserter shown in Fig 107* may not be available but the regular tracheostomy cannula always includes an olive-tipped bougie which serves fairly well

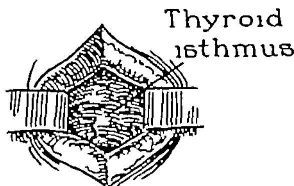
103 In elective tracheostomy the incision should be short, 2 cm and *just within the episternal notch* (*low tracheostomy*) In an emergency the incision should be longer to save time.

In rare instances there may be indications for a high tracheostomy through the cricothyroid membrane but there seldom will be any indication for high tracheostomy in an emergency In cancer of the intrinsic larynx with marked respiratory obstruction on admission high tracheostomy through the cricothyroid membrane may be preferable since it permits excision of the whole tract at subsequent total laryngectomy and preserves the trachea undamaged

104 By blunt dissection through the short incision the isthmus of the thyroid is brought into view Care should be taken to avoid tearing the inferior thyroid veins which usually lie on the surface of the isthmus



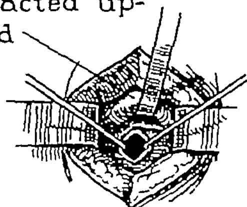
103 Location of the *incision.*



104 Approach to the trachea through the superficial tissues.

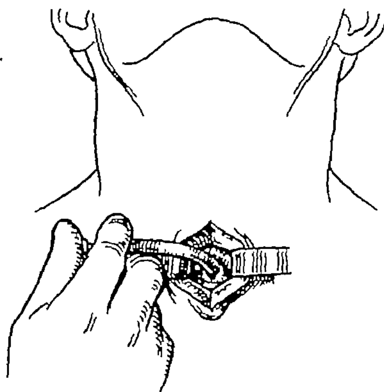
TRACHEOSTOMY CONTINUED

105 The isthmus of the thyroid is retracted upward to expose the tracheal rings. A few drops of 10 per cent cocaine are injected into the lumen through the tracheal wall With a pointed scalpel (#11 Bard-Parker blade), 2 or 3 rings of the tracheal cartilage are cut and the edge of the tracheal incision secured by tracheal hooks



105 Exposure and opening of the trachea.

106 The outer cannula of the tracheal tube with its olive tipped bougie is inserted into the lumen o the trachea.

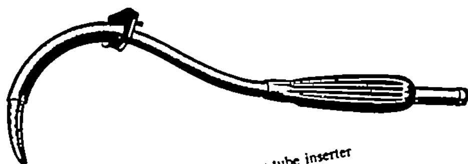


106 Insertion of the conventional tracheostomy tube with olive-tipped bougie.

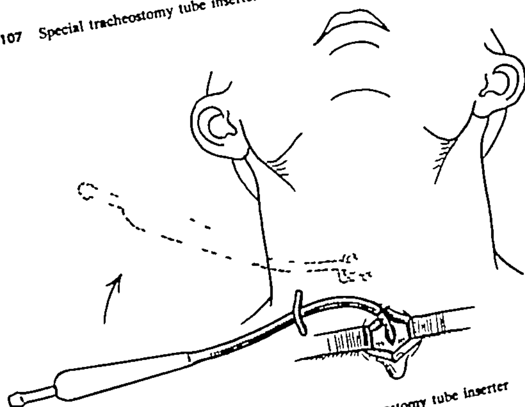
TRACHEOSTOMY CONTINUED

107 108 109 A bluntly pointed, hollow obturator whose end has numerous perforations is shown. The instrument is threaded into a standard #6 tracheostomy tube

The special inserter is of convenience in all cases and almost essential in difficult situations especially when the trachea is at a depth or when the tracheostomy is difficult from any cause



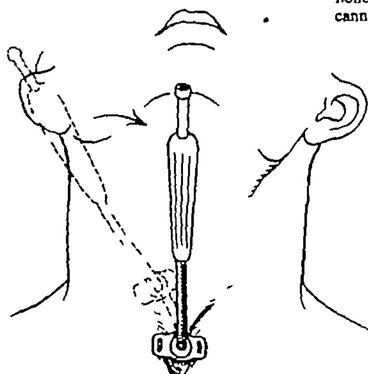
107 Special tracheostomy tube inserter



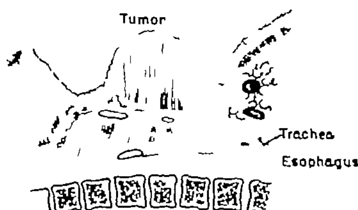
108 First maneuver in using special tracheostomy tube inserter

TRACHEOSTOMY CONTINUED

110 In cases where exposure of the trachea is difficult or impossible because of an overlying tumor, the dissection down to the trachea and incision of it may have to be made blindly guided only by the palpating finger After the trachea has been opened the cannula (threaded onto the special inserter) may also have to be inserted blindly until an exchange of air is noted through the hollow obturator The inserter and the tube are then advanced further and the hollow obturator withdrawn leaving the tracheostomy cannula in place



109 Second maneuver in using special tracheostomy tube inserter

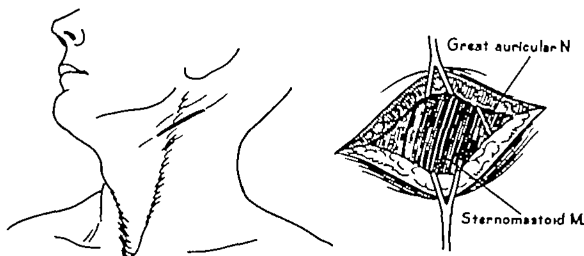


110 Tracheostomy in cases where the trachea is over laid and/or displaced by a bulky tumor

LIGATION OF EXTERNAL CAROTID ARTERY

Prophylactic ligation of the carotid artery is objectionable because the resultant scarring renders difficult or impossible a clean neck dissection should cervical metastases later occur There is no objection to unilateral or bilateral ligation of the external carotid artery in cases where it is done preliminary to the removal of highly vascular benign tumors or before radical and deep excision of basal cell carcinoma of the skin of the face.

111 The incision should be oblique about 4–5 cm in length within a wrinkle or skin crease 2.5–3 cm below the angle of the mandible centered over the anterior edge of the sternomastoid muscle When carried through the platysma, the incision will expose the sternomastoid muscle The great auricular nerve that crosses the posterior aspect of the incision should be identified retracted posteriorly and preserved.

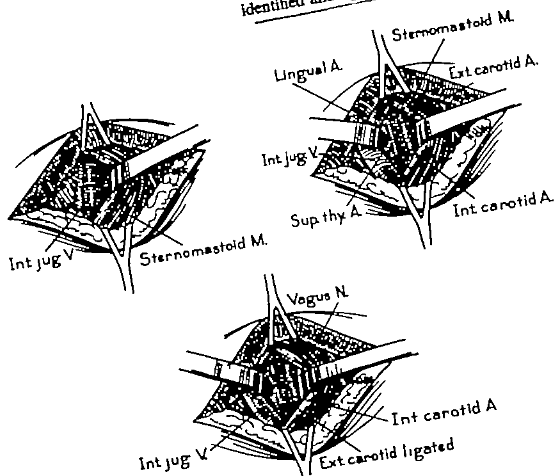


111 The incision.

LIGATION OF EXTERNAL CAROTID ARTERY CONTINUED

112 The sternomastoid muscle is retracted poste riorly and the internal jugular vein which lies just beneath is identified and retracted anteriorly By sharp and blunt dissection and with the help of th palpating finger the external carotid artery is identi fied by establishing that there are branches (Th internal carotid artery has no branches in the neck) The level of the artery between the origin of th superior thyroid artery and the lingual artery shoul be established and a ligature placed around it, car being taken not to include the vagus

To prevent early recanalization of the artery wire rather than an absorbable suture should be used If so desired, the lingual and external thyroid may b identified and ligated separately

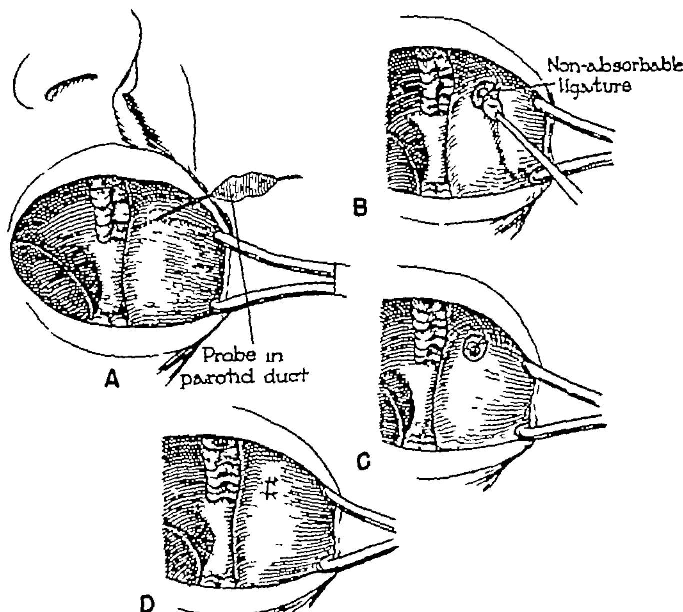


112 Exposure and ligation of the artery

LIGATION OF PAROTID DUCTS

In radical operations resulting in a pharyngostome or extensive loss of the tissues of the lower lip and chin one of the most troublesome complications is salivary incontinence and constant drooling of saliva, chiefly from the parotid glands In these cases considerable relief is obtained by ligation of the parotid ducts which is followed by a marked decrease in the flow of saliva The parotid glands usually swell and are painful for a few days following which these subjective symptoms gradually decrease and the parotid glands atrophy The operation is readily performed under local anesthesia

113 A fine probe is inserted in the parotid duct and the opening circumscribed by a narrow incision *A* The parotid duct is exposed at a depth and a nonabsorbable ligature is tied around it *B* The distal portion of the duct is then cut off *C* and the mucosal wound sutured *D*



113 Steps in ligation of parotid ducts.

GENERAL PROCEDURES (Figs 114–118)

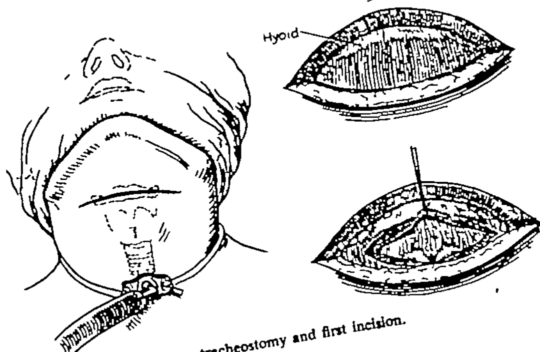
ANTERIOR PHARYNGOTOMY

The shortest and most practical approach to the hypopharynx is through the skin of the anterior neck between the thyroid cartilage and the hyoid bone. In some cases it is advantageous to resect the central portion of the hyoid The extent of the exposure is limited to some degree by risk of injury to the superior laryngeal nerves by section or stretching Through this approach tumors may be excised from the epiglottis, lateral and posterior pharyngeal walls, and base of the tongue. The cavity of the naso-pharynx also may be visualized.

In the postoperative care it is prudent to maintain the tracheostomy for a day or two after which the greatest risk of local swelling and edema has passed. All feeding should be by nasal tube for the first week or ten days If there is an undue degree of dysphagia, or a tendency to aspirate ingesta, there has probably been temporary or even permanent damage to the superior laryngeal nerves. In these cases it is best to continue feeding by nasal tube until the disability has improved.

114 Preliminary tracheostomy is performed and breathing tube attached to the anesthesia machine. A horizontal incision is made and carried down to the hyoid bone. The sternohyoid muscles are severed exposing the cricothyroid membrane.

115 The first opening into the pharynx is dire… into the vallecula, guided by a gloved finger w… the pharynx

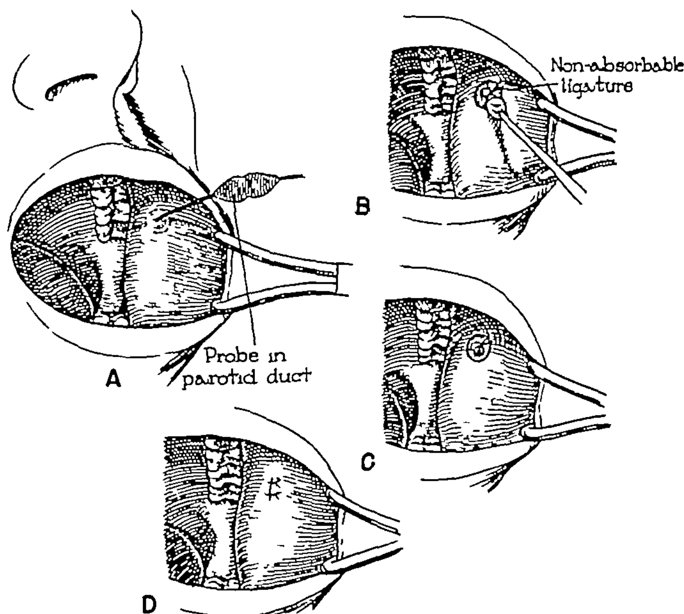


114 Preliminary tracheostomy and first incision.

LIGATION OF PAROTID DUCTS

In radical operations resulting in a pharyngostome or extensive loss of the tissues of the lower lip and chin, one of the most troublesome complications is salivary incontinence and constant drooling of saliva, chiefly from the parotid glands. In these cases considerable relief is obtained by ligation of the parotid ducts, which is followed by a marked decrease in the flow of saliva The parotid glands usually swell and are painful for a few days following which these subjective symptoms gradually decrease and the parotid glands atrophy The operation is readily performed under local anesthesia

113 A fine probe is inserted in the parotid duct and the opening circumscribed by a narrow incision *A* The parotid duct is exposed at a depth and a non-absorbable ligature is tied around it, *B* The distal portion of the duct is then cut off *C* and the mucosal wound sutured *D*



113 Steps in ligation of parotid ducts.

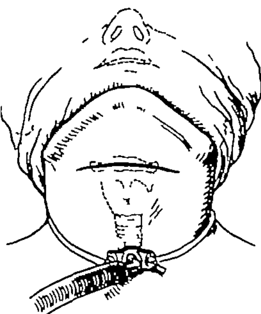
ANTERIOR PHARYNGOTOMY

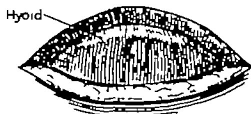
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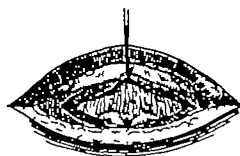
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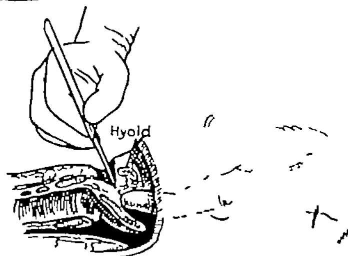
115 The first opening into the pharynx is directl into the vallecula, guided by a gloved finger withi the pharynx







114 Preliminary tracheostomy and first incision



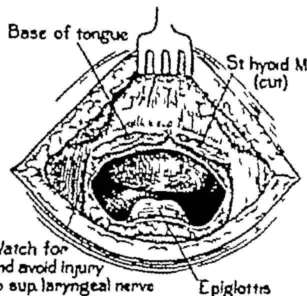
115 Opening the pharynx.

ANTERIOR PHARYNGOTOMY CONTINUED

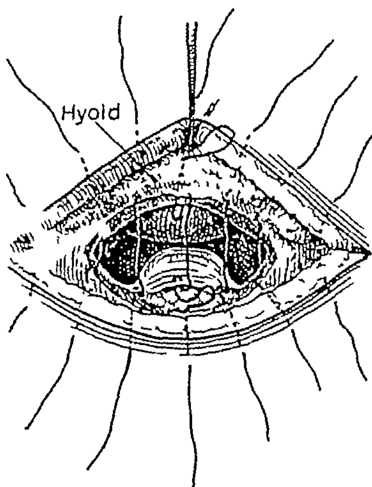
116 The small opening into the pharynx is then enlarged keeping close to the hyoid bone and watching laterally to see that the superior laryngeal nerves are not cut.

117 A single layered composite suture should be used a procedure which has the advantage of eliminating the dead wound space

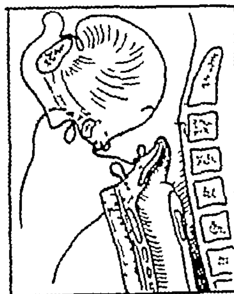
118 The composite sutures are converted into mattress sutures so as to evert the skin Alternate superficial sutures are added.

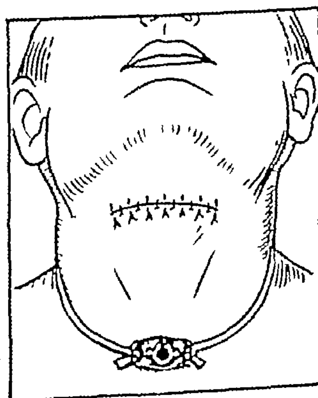


116 Wider opening into the pharynx



117 Closure by composite suture

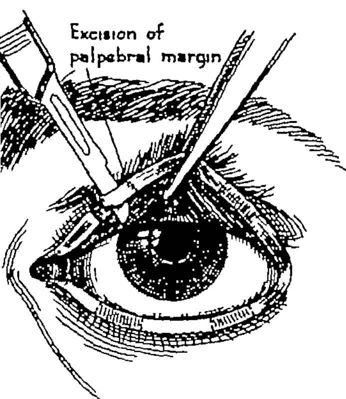




118 Complete closure of the wound.

FUSION OF EYELIDS

The homolateral eyelids should be fused in all cases when the surgeon believes that the func tion of the whole 7th nerve is either temporarily or permanently destroyed The fusion should be performed at the close of the operation rather than as a second step a few days later If func tion of the 7th nerve is regained, the fusion can be released

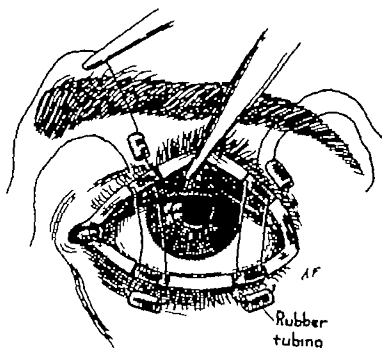


119 Excision of palpebral margin

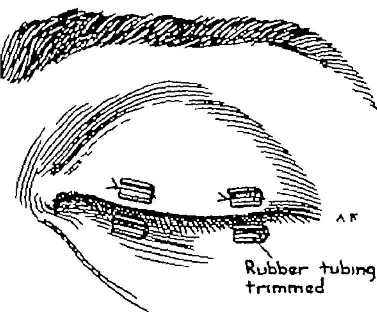
119 The sites and extents of the fusion of the eye lids should be marked with nicks The mucous mem brane of the palpebral margin is excised, preserving the line of cilia

120 Mattress sutures threaded through sections of rubber tubing are placed through the sites of the excised palpebral margin

121 The sutures are tied so as to bring the raw areas into apposition and the sections of rubber tub- ing are split so as to reduce their bulk



120 Placement of the mattress sutures.

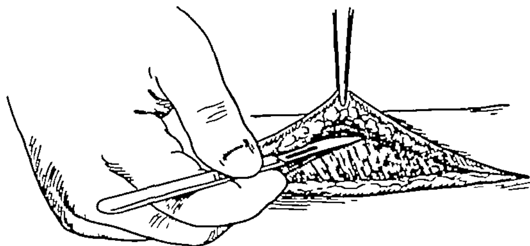


121 The completed operation

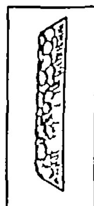
FORMATION OF TUBED PEDICLE GRAFTS

The selection of the donor site, the direction of the long axis, and decision as to the dimensions of a tubed pedicle should be made only *after careful preliminary planning* For the repair of facial or cervical defects the most practical donor site is in the clavicular area or anterior lower neck. The lateral chest wall or the abdomen are less desirable except when unusually great amounts of tissue are needed for the repair In women the upper lateral breast will often serve as a practical donor site The immediate circulation in the tube is promoted by the injection of a weak solution of *epinephrine into the tissues to be tubed just before* any incision. The entire length of the raised flap should be tubed In most cases the underlying tissue defect can be closed by direct approximation of its edges and suture The dressing should exert no localized pressure.

122 The edges of the flap should be beveled so as to avoid an excess of fat protruding along the suture line In the clavicular area the deep level of the incision should be the platysma muscle If the tube is raised on a higher level in the neck the platysma should be included in the tube



122 Raising the flap



Edges of flap bevelled

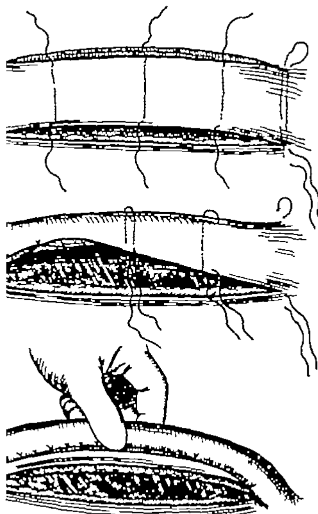
FORMATION OF TUBED PEDICLE GRAFTS
CONTINUED

123 A few preliminary stay sutures are placed as to insure an even closure These sutures *pass through the skin only* so as to favor (rather than eversion) of the skin edges.

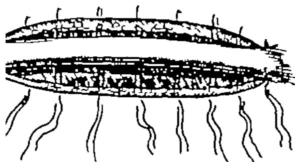
124 After formation of the tube the defect is closed by eversion sutures with the ck extending to the end of the tube and the defect entire mobilized flap thus is formed into the thereby avoiding the waste which would occur partial tubing only

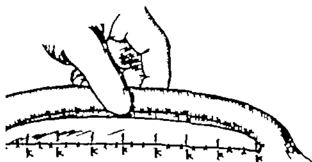
125 The tissues just over or just below the cl with the lines of incision parallel to the clavicle an excellent donor site for the repair of facial

126 *If the tube is to be raised entirely from* neck the midline just above the inner end of clavicle is a preferable site The incisions *be made straight across rather than in a* fashion

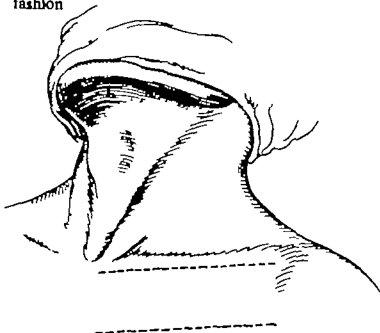


123 *Suture of the pedicle.*

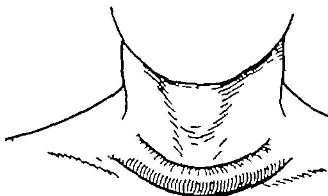




24 Closure of the underlying defect.



125 The clavicular area as a donor

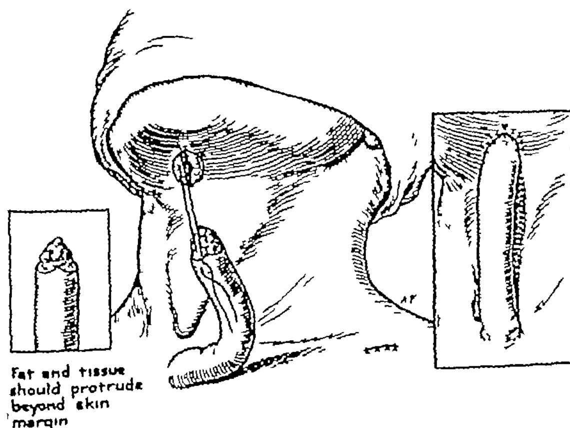


126 The lower anterior neck as a donor

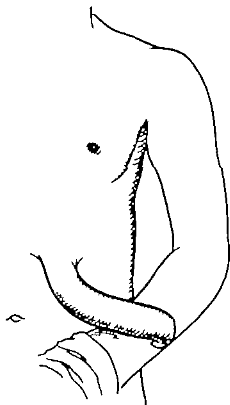
MIGRATION OF TUBED PEDICLE GRAFTS

Migration of tubed pedicles may be started as soon as there is complete healing of the incisions incident to the previous formation of the tube From the practical standpoint there is little to be gained by beginning the migration earlier than six weeks. When the donor site is the clavicular area or the anterior chest wall the migration is best made in several stages by "walking" the tube up the anterior chest wall or neck When the donor site is the anterior abdominal wall time can be saved by using the arm as the intermediate host.

127 In detaching one end of the tube, a cone shaped protrusion of fat should be taken so that the incised wound of the recipient site can be plugged with this protrusion of fat and thereby avoid a dead space in which a hematoma would collect



127 Method of transfer of a severed end of a pedicle tube and its suture into a recipient incision.

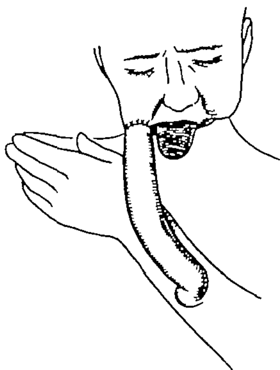


128 The forearm as the intermediate host for migration of an abdominal tube.

MIGRATION OF TUBED PEDICLE GRAFTS
CONTINUED

128 129 Pedicle tubes formed on the anterior dominal wall are best migrated by using the forearm as the intermediate host.

A great deal of time is saved by shifting the from the abdominal area directly to the face by taching it and elevating the arm



129 Shift of the abdominal tubed pedicle to the facial area by elevating the arm

Migration of Tubed Pedicles to Defects in the Submental Area

130 In this case a long abdominal tube of large caliber has been shifted (via the arm) to an extensive defect of the lower anterior face

131 The long tube has been severed in its middle and re attached so as to provide two adjacent and parallel tubes

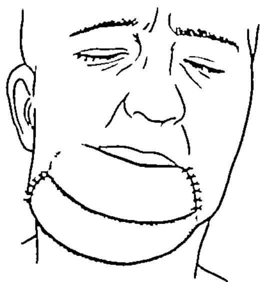
132 After the divided and re-implanted tubes have healed their edges are fused (See Figs 135–138)





130 Attachment of a large tube to the submental area.





131 Divided and re attached submental tube grafts



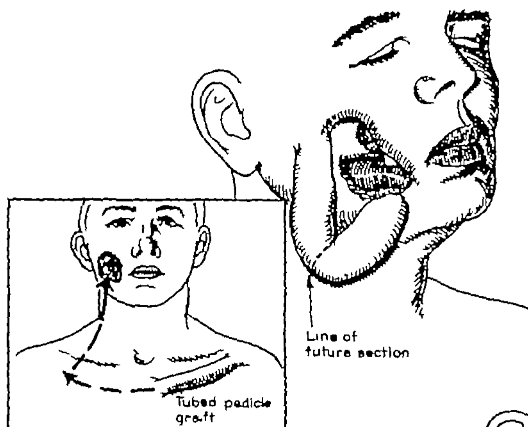
132 The healed appearance of the fused tubes

MIGRATION OF TUBED PEDICLE GRAFTS
CONTINUED

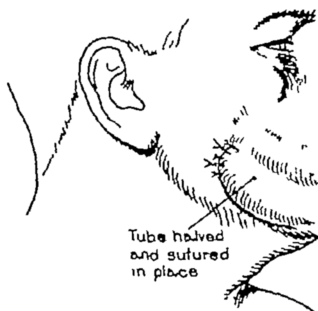
Migration of Tubed Pedicles to Lateral Cheek Area

133 A tubed pedicle has been formed in the clavicular region and migrated by stages to the of a through-and-through defect of the cheek line of future division of the tube has been mar

134 The tube has been halved and each end implanted



133 Migration of pedicle tube to the lateral cheek area.

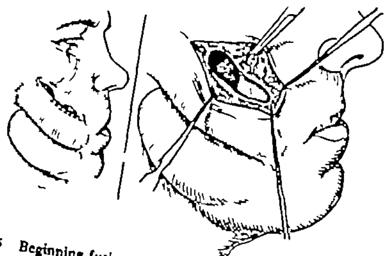


134 The divided and re implanted tube

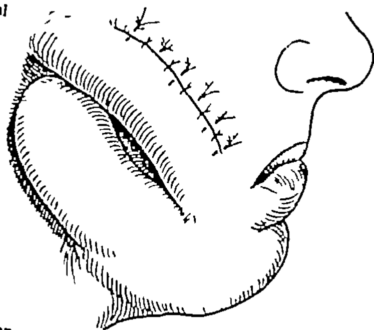
Migration of Tubed Pedicles to Lateral Cheek Area continued

135 136 137 The slit-like openings are closed by freshening their edges The inner edges are approximated by sutures first tied into the mouth and then pulled out through the oral cavity

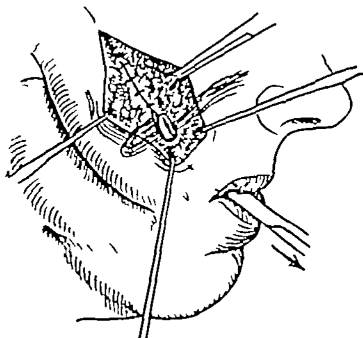
138 The edges of the skin of the wound have been brought together A similar procedure is carried out on the lower defect and at a later date the central opening is closed in the same manner



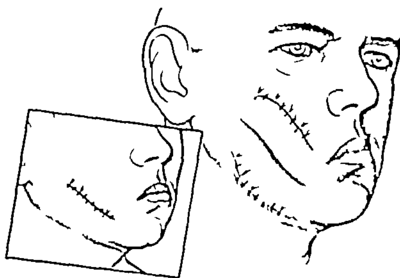
135 Beginning fusion of the tubes.



137 Suture of the skin surface wound.



136 Suture of the buccal surface wound



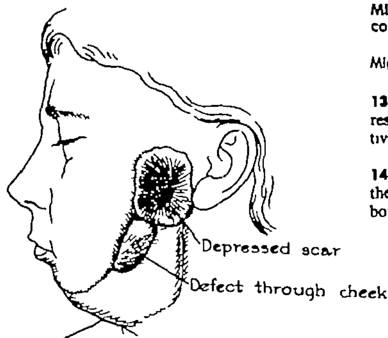
138 Final closure of cheek defect

MIGRATION OF TUBED PEDICLE GRAFTS
CONTINUED

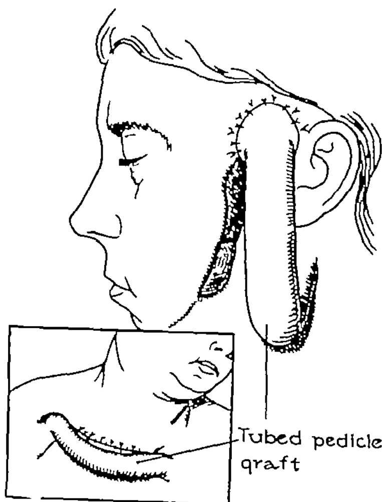
Migration of Tubed Pedicles to Lateral Face Area

139 A scarred lateral cheek and face defect resulted from wide excision of a recurrent tive-tissue tumor of the pterygomaxillary region

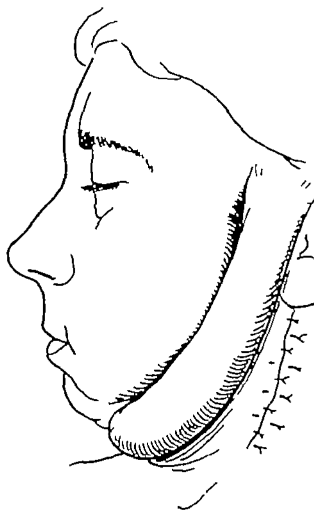
140 141 A tubed pedicle has been su the clavicular area and migrated in stages to borders of the defect.



139 The defect before beginning closure.



140 An intermediate stage of pedicle migration.

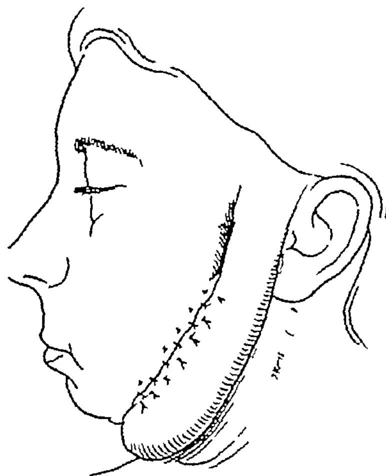


141 An intermediate stage of migration tube.

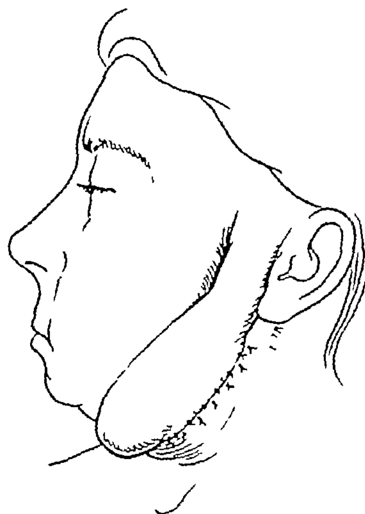
MIGRATION OF TUBED PEDICLE GRAFTS
CONTINUED

Migration of Tubed Pedicles to Lateral Face Area continued

142 143 The tube is fused first with the anterior borders of the defect and at a later stage to the posterior borders of the defect The upper end of the tube covers a depressed scar only



142 Fusion to the anterior border of the defect



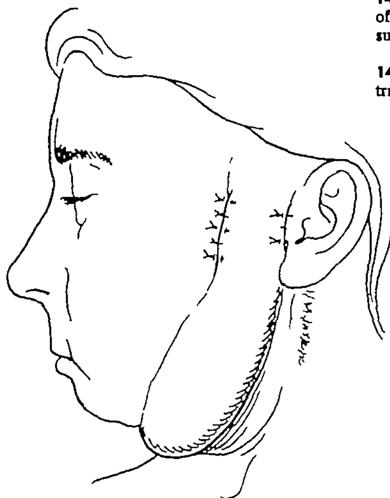
143 Fusion to the posterior border of the defect

MIGRATION OF TUBED PEDICLE GRAFTS
CONTINUED

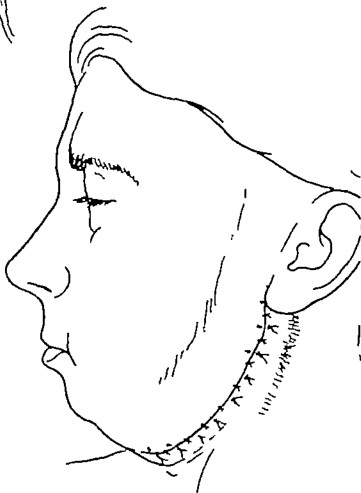
Migration of Tubed Pedicles to Lateral Face Area continued

144 *The depressed scar underlying the upper* of the tube has been excised and the tube opened sutured into the depression.

145 At a later stage the tube has been defatted trimmed so as to improve the cosmetic



144 Repair of the depressed scar



DONOR SITES FOR SKIN GRAFTS FOR FACIAL DEFECTS

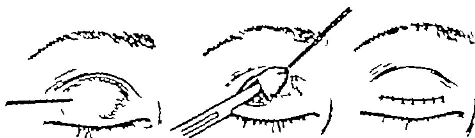
Full-thickness grafts from the upper eyelids from behind the ear and mastoid region or from the clavicular area are often preferable for closure of defects in such areas as the middle of the cheeks or the tip of the nose where scarring incident to a rotated pedicle would be objectionable, or where the skin in adjacent tissues is not sufficiently elastic to favor closure by other methods Grafts from the upper eyelid match very well with the skin of the upper cheeks adjacent to the lower eyelids Grafts from behind the ear and mastoid area match best with the tip or bridge of the nose and with the skin of the midportion and lower portion of the face The larger full-thickness grafts over 3 cm in diameter are best taken from the clavicular area

146 The upper eyelid provides a suitable type of skin for repair of defects of the upper anterior cheeks This source is not suitable for replacement in hairy areas, such as the lower cheeks and lips. The mobilization of the eyelid graft is facilitated by subcutaneous injections of saline solution to raise the skin

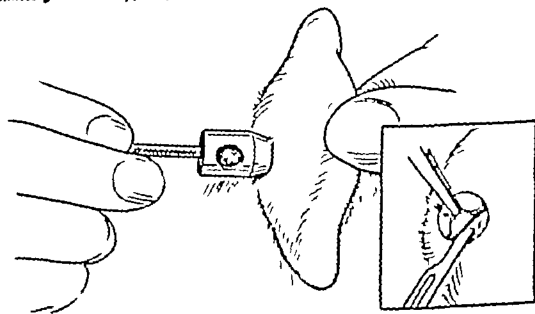
147 148 The back of the ear or mastoid region is a suitable source for moderate-sized full-thickness skin grafts for defects of most parts of the face other than those of the upper cheeks. The skin back of the ear is slightly thicker has more color and a coarser texture than that of the upper eyelid



147 Removal of skin graft from the back of the ear



146 Removal of full thickness graft from upper eyelid.

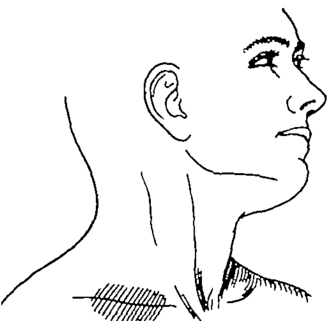


148 Removal of full thickness skin graft from the back of ear by punch

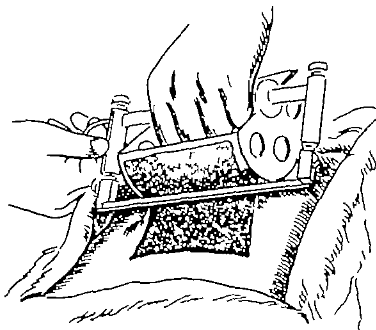
DONOR SITES FOR SKIN GRAFTS FOR FACIAL DEFECTS CONTINUED

149 The clavicular area is a useful site for full-thickness grafts The skin from this site is what thicker than that back of the ear but may slightly hairy The "take" is a little less certain t with thinner grafts from the back of the ear

150 For grafts to defects of either the hairy upper temporal regions or large operative defects the ear where a good cosmetic result is in any case impossibility split thickness dermatome grafts from the abdominal wall are most practicable



149 The clavicular area as a donor site for full-thickness grafts.



150 Removal of split-thickness grafts from the abdomen by dermatome.

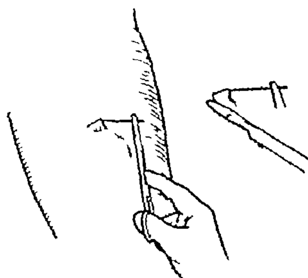
PINCH GRAFTS AS AN AID TO INCOMPLETELY CLOSED INCISIONS

In certain areas especially in the scalp, the size of the ellipse will permit of almost complete closure by direct approximation, but overforceful attempts to completely close these incisions frequently result in excessive tension and necrosis of the edges of the too-tightly closed incision

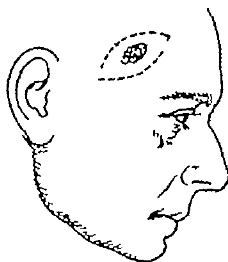
Rather than resort to large skin grafts for the whole defect, such incisions may be partly closed by sutures drawn judiciously taut and the small remaining defect filled with pinch grafts. The resulting healed scar is almost as satisfactory as though the incision had been primarily closed by suture

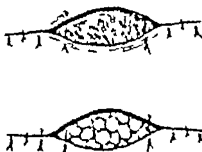
151 Pinch grafts can be taken under local anesthesia if convenient. A sharp needle firmly held in a clamp raises the skin and the pinch graft is mobilized with a scalpel

152 After partial closure of the angles of the wound the central portion is filled with pinch grafts, thereby avoiding the risk of overtight or incomplete closure of the widest portions of the wound.



151 Taking pinch grafts.

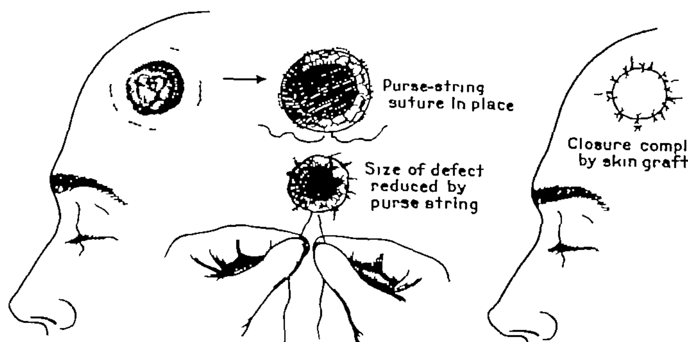




152 Partial closure of a wound by pinch grafts.

REDUCTION IN SIZE OF CIRCULAR DEFECTS BY PURSE-STRING SUTURES BEFORE SKIN

153 The size of circular defects in any part of body may be considerably reduced (50 per cent more) by the use of a purse-string suture of absorbable material such as nylon The purse is tied on the skin surface so that a few days l• it may be removed without disturbing the graft.



153 Reduction in wound size by purse-string suture

Chapter 9

OPERATIONS FOR CANCER OF THE SKIN OF THE FACE (EYELIDS, NOSE, LIP AND EAR)

ELLIPTICAL INCISIONS FOR EXCISION OF SMALL CANCERS OF THE FACE

If applicable the simplest form of incision for the excision of facial skin cancer is the ellipse The scarring is minimal and the deformity depends mainly on the size of the excision and its position and whether its long axis can be made parallel to the line of major tension wrinkles Elaborate charts or diagrams of "Langer's lines" have been used for this purpose but on the face such charts are not nearly so reliable as the actual position and direction of the tension lines or wrinkles in the given patient The position of the lines of tension and preferable lines of incision are much more accurately determined by directing the patient to grimace so as to bring out the wrinkles in the area under consideration.

In cases where the long axis of the tumor must be at right angles to the natural wrinkle, or where the lesion is large or situated in such critical areas as the lower eyelid, palpebral margin lateral aspect of the nose etc. most defects are better closed by transposition of tissues (as, for example, rotated flaps or skin grafts)

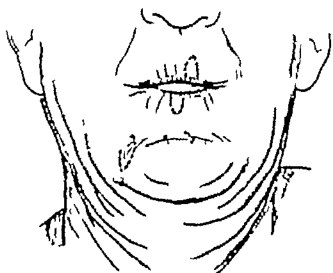
OPERATIONS FOR CANCER OF THE SKIN OF THE FACE GENERAL (Figs. 154–156)

ELLIPTICAL INCISIONS FOR EXCISION OF SMALL CANCERS OF THE FACE

154 By directing the patient to grimace the line or direction of the long axis for elliptical incisions is established On the forehead and about the bridge of the nose and outer canthus the lines are horizontal About the cheeks the tension lines run obliquely or perpendicularly Small growths of the lower eyelid can be excised through horizontal ellipses, but large ellipses from the lower eyelid tend to result in ectropion

155 About the lips the tension lines run radially from the mouth opening *On the chin they run horizontally* in the midline and obliquely perpendicular at the sides

156 On the sides of the neck the wrinkles and tension lines run obliquely downward and forward



155 Ellipses near the mouth and on the chin



154 Tension line and form of ellipses for excision of sm

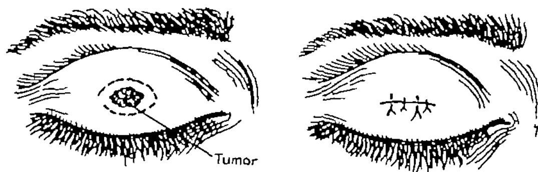


OPERATIONS FOR CANCER OF THE SKIN OF THE FACE: EYELIDS (Fig 157)

EXCISION OF SMALL GROWTH OF UPPER EYELID BY SIMPLE ELLIPSE

Horizontal elliptical excision may be used for fairly large growths of the upper eyelid without great risk of functional disability since the skin of the upper eyelid is redundant. For the lower eyelid only small or moderate-size ellipses can be used without the risk of producing ectropion. For the lower eyelid consideration should be given to the technics shown in Figs 165 to 167

157 The injection of local anesthetic (or solution) tends to raise the skin of the upper ey and to facilitate adequately deep and wide excl of an ellipse



157 Excision of growth of upper eyelid through simple ellipse.

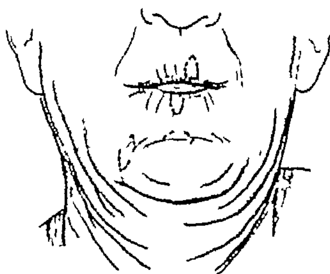
OPERATIONS FOR CANCER OF THE SKIN OF THE FACE GENERAL (Figs 154–156)

ELLIPTICAL INCISIONS FOR EXCISION OF SMALL CANCERS OF THE FACE

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156 On the sides of the neck the wrinkles and tension lines run obliquely downward and forward.



155 Ellipses near the mouth and on the chin.



154 Tension lines, wrinkles, and form of ellipses for excision of small facial cancers.

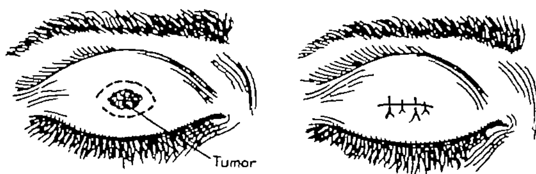


156 Tension lines and wrinkles on the skin of the neck

EXCISION OF SMALL GROWTH OF UPPER EYELID BY SIMPLE ELLIPSE

Horizontal elliptical excision may be used for fairly large growths of the upper eyelid without great risk of functional disability since the skin of the upper eyelid is redundant. For the lower eyelid only small or moderate-size ellipses can be used without the risk of producing ectropion. For the lower eyelid, consideration should be given to the technics shown in Figs 165 to 167

157 The injection of local anesthetic (or solution) tends to raise the skin of the upper ey and to facilitate adequately deep and wide ω of an ellipse

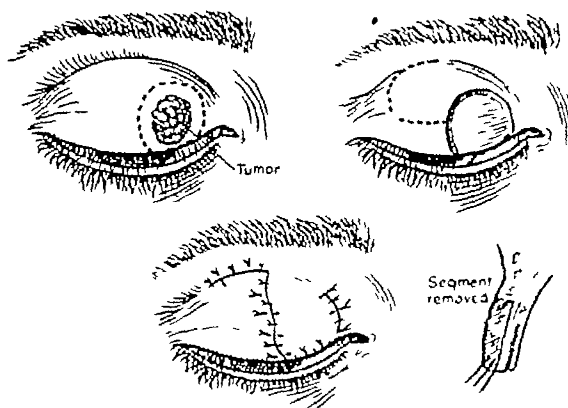


157 Excision of growth of upper eyelid through simple ellipse.

EXCISION OF GROWTH OF THE UPPER EYELID APPROACHING THE PALPEBRAL MARGIN—CLOSURE BY ROTATED FLAP FROM ADJACENT UPPER EYELID

The principle of the rotated pedicle flap for the closure of superficial defects finds wide usefulness for growths about the eyelids, the bridge of the nose the posterior cheeks, the skin about the lips and on the neck but is less useful for the closure of defects about the tip of the nose The flaps should be reasonably thin If too thick they tend to produce an unsightly bulge necessitating later defatting

158 Fairly large lesions of the upper eyelid, including the palpebral margin may be excised and closed by rotated pedicle flaps from the eyelid itself The skin of the upper eyelid is almost always redundant.

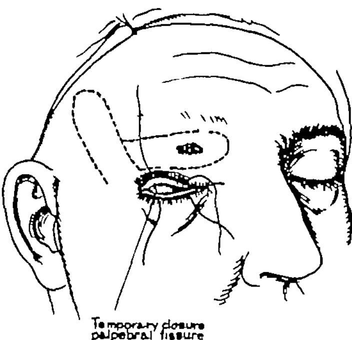


158 Repair of upper eyelid defect by rotated flap

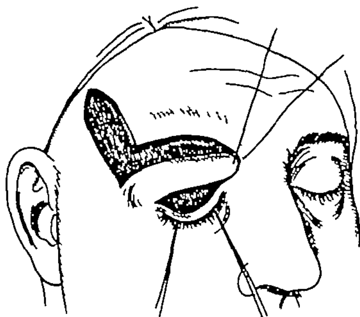
CLOSURE OF UPPER EYELID DEFECT BY ROTAT FLAP FROM THE TEMPORAL AREA

Large or deeply infiltrating lesions of the upper eyelid and supra-orbital region can be excised and closed by rotated pedicle flaps from the temporal region.

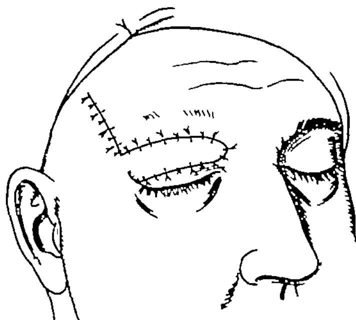
159 160 161 The palpebral fissure is temp rarily closed by a simple nylon suture left in pla for the first few days until the pressure dressings c be omitted.



159 Outline of excision and flap



160 Mobilization and rotation of flap



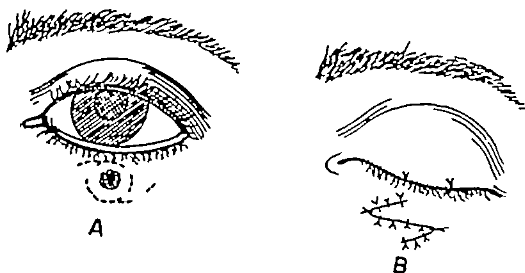
161 The completed operation.

OPERATIONS FOR CANCER OF THE SKIN OF THE FACE· EYELIDS (Fig 162)

CIRCULAR SHAPED EXCISION WITH Z-PLASTIC CLOSURE FOR GROWTH NEAR PALPEBRAL MARGIN

When growths closely approximate the palpebral margin but do not actually invade it they may still be excised conservatively by a circular-shaped incision and closure effected by a Z plastic from two flaps rotated in from the sides With this technic the excision of skin near the points of a wedge is avoided and actually the skin so preserved in these areas is rotated to prevent shortening of the lid in the vertical direction

162 *A* The growth is circumscribed by a circular incision with two extensions to provide flaps for a Z-closure *B* The flaps have been transposed and the closure made in the form of a Z, avoiding shortening of the lid The temporary suture of the eyelids has been made it is released after the first few days



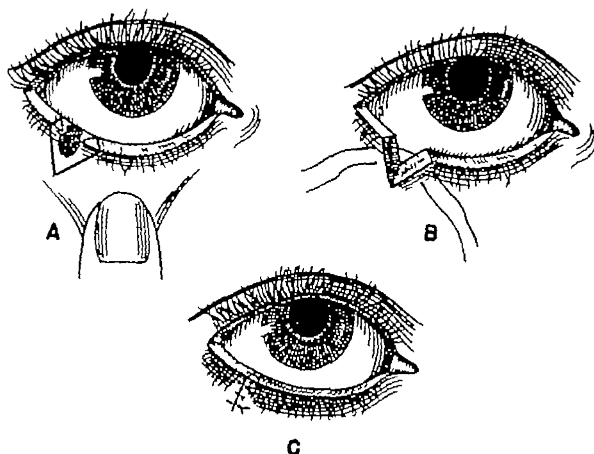
162 Z-plastic closure of lower eyelid defect

OPERATIONS FOR CANCER OF THE SKIN OF THE FACE: EYELIDS (Fig 163)

WEDGE-SHAPED EXCISION OF GROWTH OF PALPEBRAL MARGIN

Growths of the eyelid involving the palpebral margin usually involve more of the outer (skin) surface than the inner surface of the lid, so that a wedge excision need not include as much of mucosa as of skin

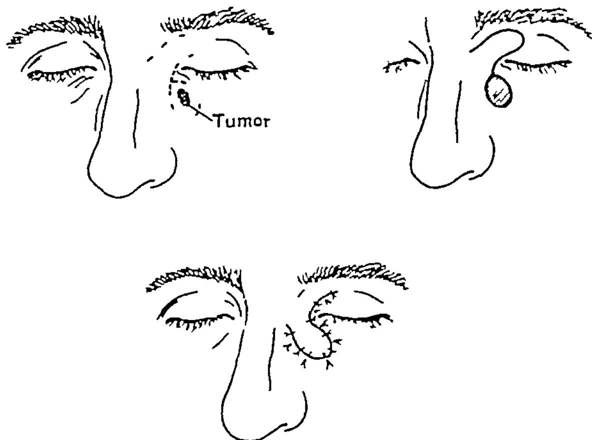
163 A larger wedge is made on the skin than the mucosal surface (*A* and *B*) Only one layer sutures is used, which perforates the raw surface to but not including the mucosa, *B* When closed, lower eyelid is shortened only slightly *C* If a larger wedge of the lower eyelid than that shown is be removed, then some other form of repair ~ be employed.



163 Wedge-shaped excision of lower eyelid.

EXCISION OF GROWTH BELOW THE INNER CANTHUS CLOSURE BY ROTATED FLAP FROM THE UPPER EYELID

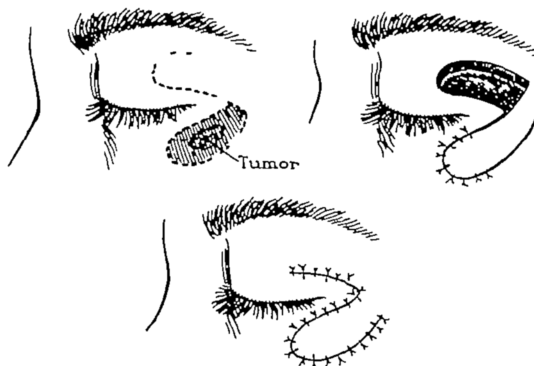
164 *For lesions just below the inner canthus* the operative defect can be most conveniently closed by rotated pedicle flap of skin from the upper lid



164 Closure by rotated flap

EXCISION OF GROWTH OF THE LOWER EYELID CLOSURE BY ROTATED FLAP FROM THE UPPER EYELID

165 Growths of the lower eyelid too large simple ellipse can be closed by rotated flaps ... down around either the inner or outer canthus the upper eyelid.

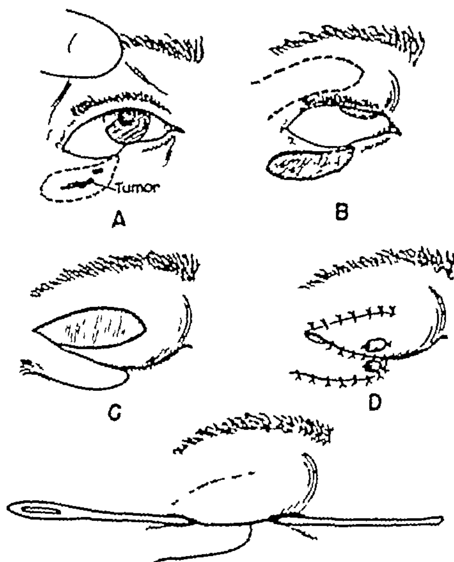


165 Closure by rotated flap

ⱡ

EXCISION OF GROWTH OF LOWER EYELID NEAR OUTER CANTHUS CLOSURE BY ROTATED FLAP FROM UPPER LID

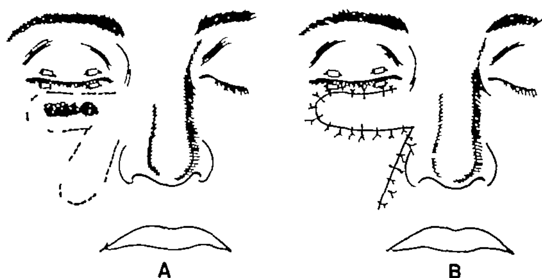
166 *A* In this case there was a recurrent tumor in the scar of a former excision There was a portion of normal conjunctiva remaining *B* The growth has been excised and a pedicle flap outlined on the upper eyelid. *C* The flap from the upper eyelid has been rotated down to cover the defect *D* The flap has been sutured into place and the wound of the upper eyelid closed A segment of palpebral margin has been excised from the upper eyelid and a fusion of the lids made with a mattress suture *E* The immediate healed condition The probe lies just under the fusion of the eyelids and will be at least partly released after several weeks



OPERATIONS FOR CANCER OF THE SKIN OF THE FACE. EYELIDS (Fig 167)

ROTATED FLAP FROM NASOLABIAL GROOVE CLOSURE OF DEFECTS OF LOWER EYELID

167 The main operation should be preceded by fusion of the eyelids The long axis of the flap to rotated should be run in the general direction of nasolabial groove, *A*



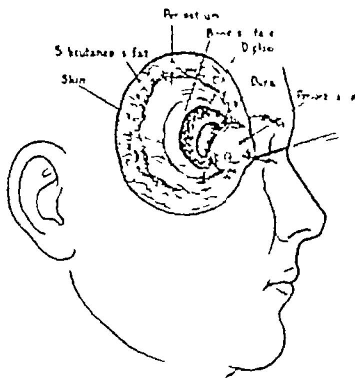
167 Closure of operative defects of the lower eyelid by rotated flap from the cheek and upper lip

EXCISION OF GROWTH OF THE TEMPORAL REGION CLOSURE BY SKIN GRAFT

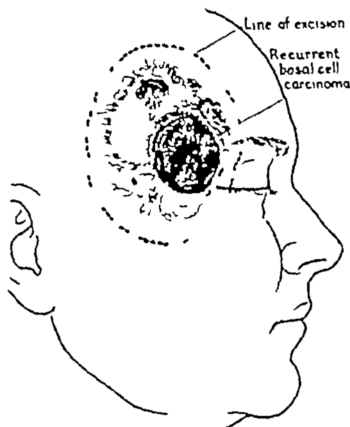
Large defects resulting from excision of infiltrating growths in the temporal area necessitate large grafts of the split variety The cosmetic appearance in such procedures is of less importance than on the anterior portions of the face

168 169 In most cases it is justifiable to disregard the underlying tissues and to deeply and widely excise the tumor accepting the resultant dysfunction disability and cosmetic appearance so long as it is compatible with life and freedom from discomfort Split skin grafts will "take" equally well over any living tissue e g subcutaneous fat fascia muscle periosteum exposed or incised bone dura and even cerebral cortex.

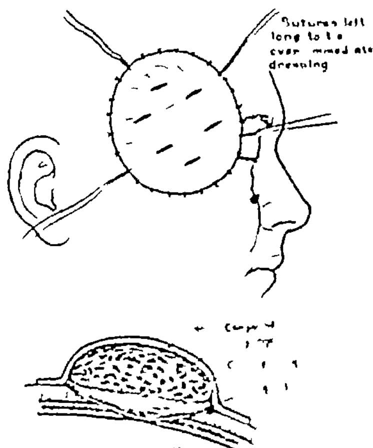
170 Large split grafts should have multiple punctures to facilitate escape of serum A dry sea sponge makes an excellent compression dressing, especially when held in place by a cup-shaped mould of dental compound



169 Deep extent of excision exposing a variety of tissues.



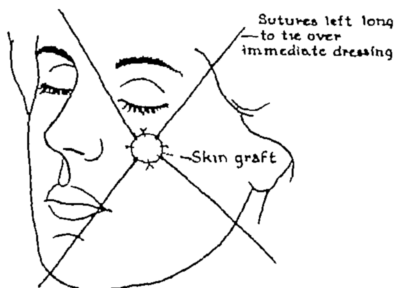
168 Marginal extent of excision



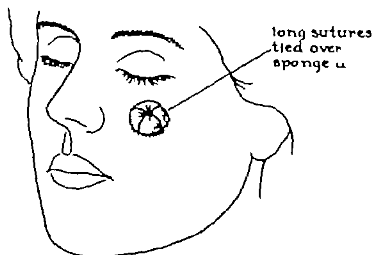
170 The completed skin graft and pressure dressing

EXCISION OF GROWTH OF THE SKIN OF THE CHEEK; CLOSURE BY FULL-THICKNESS SKIN GRAFT

171 172 Skin grafts in areas such as the malar zygomatic regions can be immobilized efficiently by leaving several sutures long and tying them over gauze or waste sponge of the same size as the graft A larger compression dressing is then with a bandage around the entire head



171 The graft sutured into place



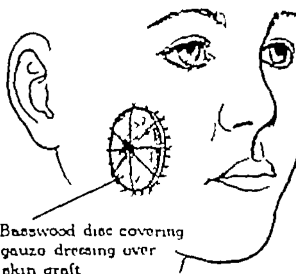
172 Immediate sponge dressing held in place by sutures.

CLOSURE OF LARGE CHEEK DEFECT BY SPLIT GRAFT

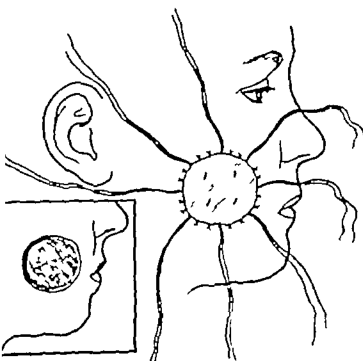
173 For large defects (more than 4 to 8 cm.) in the skin of the cheeks it may be impossible to obtain full thickness grafts of sufficient size from adjacent areas. For these it may be expedient to apply split thickness grafts from the abdomen or chest. Such split thickness grafts have the disadvantage of contracting more than those of full thickness.

174 It may be more expedient to employ a previously prepared dental stent within the mouth and a plaque of basswood splint over the cheek

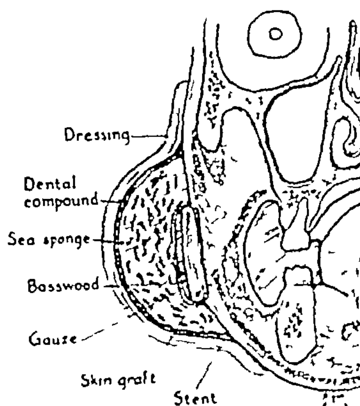
175 A sea sponge is then placed over the immediate dressing which in turn is held in place by a cup-shaped cover of dental compound.



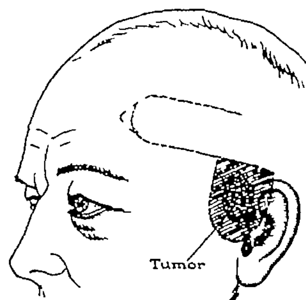
174 Long sutures tied over the immediate dres-
ing and a plaque of basswood splint.



73 The operative defect and the split thickness graft
utured into place

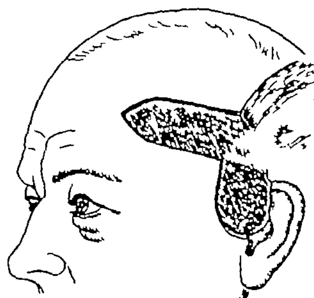


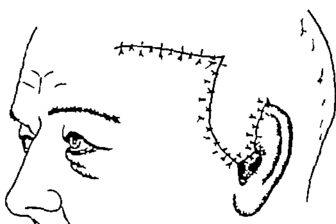
175 The completed pressure dressing and the de
stent or prosthesis in the buccal cavity



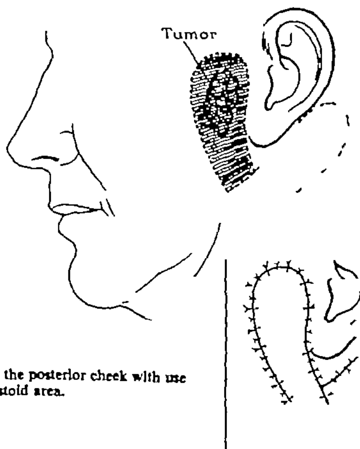
EXCISION OF GROWTH OF THE SKIN OF THE CHEEK; CLOSURE BY ROTATED FLAP FROM THE TEMPORAL OR THE MASTOID AREA

176 177 The defects following excision of growths of the temporal and preauricular region can be closed by rotated flaps either brought down from the scalp or forward from the postauricular region





76 Rotated flap from temporal area for defect just n front of and partly including the auricle.

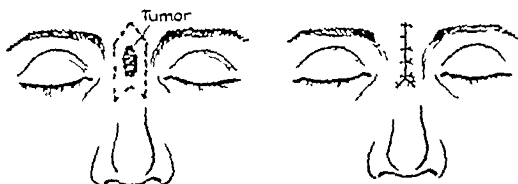


177 Excision of growth of the posterior cheek with use of rotated flap from the mastoid area.

OPERATIONS FOR CANCER OF THE SKIN OF THE FACE: NOSE (Fig 178)

EXCISION OF GROWTH OF BRIDGE OF THE NOSE; CLOSURE BY DIRECT SUTURE

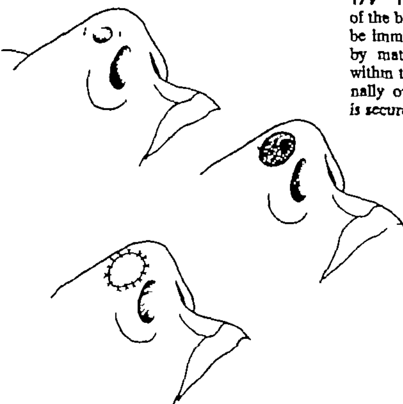
178 In tumors of the bridge of the nose just below the glabella, the form of incision is that shaped like the feather of an arrow



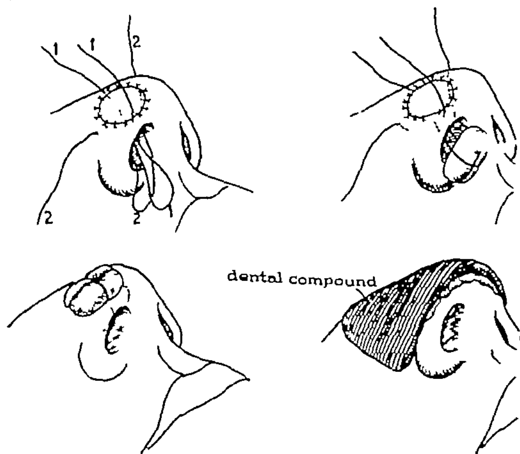
178 Feather shaped incision for bridge of nose.

EXCISION OF GROWTH NEAR TIP OF NOSE; CLOSURE BY SKIN GRAFT AND SANDWIC PRESSURE DRESSING

179 180 For small operative defects of the ... of the bridge or the tip of the nose the skin graft m be immobilized by a sandwich type dressing by mattress sutures holding Vaseline-gauze ... within the nasal cavity and a plain gauze pack externally over the graft The overall pressure dres. *is secured by a covering of dental compound*



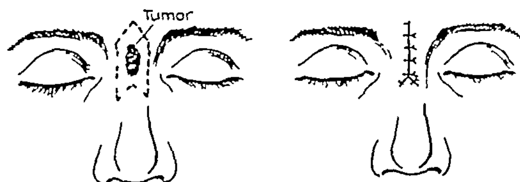
79 The excision and placement of full-thickness grafts from the astoid area (see Figs. 146–148)



180 Sandwich-type dressing.

EXCISION OF GROWTH OF BRIDGE OF THE NOSE; CLOSURE BY DIRECT SUTURE

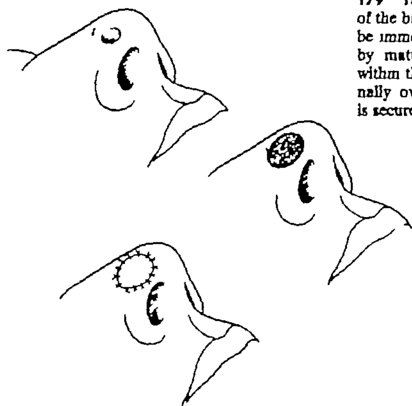
178 In tumors of the bridge of the nose just below the glabella the form of incision is that shaped like the feather of an arrow



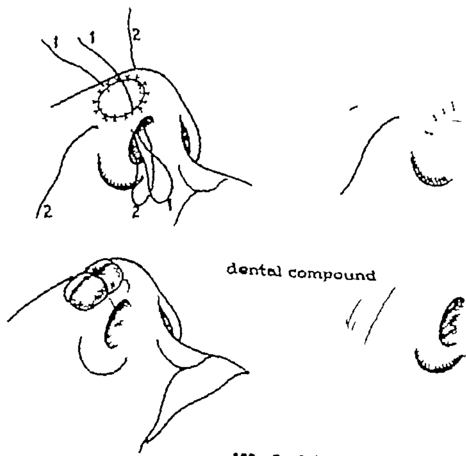
178 Feather shaped incision for bridge of nose.

EXCISION OF GROWTH NEAR TIP OF NOSE; CLOSURE BY SKIN GRAFT AND SANDWICH-TYP PRESSURE DRESSING

179 180 For small operative defects of the ski of the bridge or the tip of the nose the skin graft ma be immobilized by a sandwich-type dressing secure by mattress sutures holding Vaseline-gauze pack within the nasal cavity and a plain gauze pack exte nally over the graft. The overall pressure dressin is secured by a covering of dental compound.



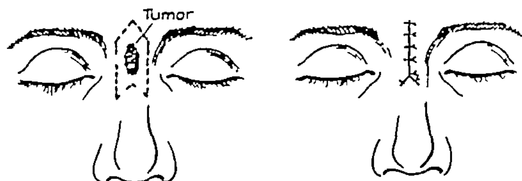
179 The excision and placement of full-thickness grafts from the mastoid area (see Figs. 146–148)



OPERATIONS FOR CANCER OF THE SKIN OF THE FACE: NOSE (Fig 178)

EXCISION OF GROWTH OF BRIDGE OF THE NOSE; CLOSURE BY DIRECT SUTURE

178 In tumors of the bridge of the nose just below the glabella the form of incision is that shaped like the feather of an arrow



178 Feather-shaped incision for bridge of nose

EXCISION OF THE FULL THICKNESS OF THE MARGIN OF THE NASAL ALA; REPAIR BY A DOUBLED ROTATED FLAP

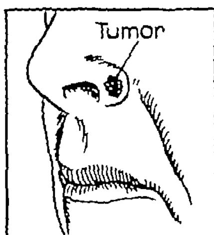
When cancer arises exactly in the edge of the ala or when a growth of the skin invades the entire thickness of the nasal wall operative defects of small or moderate size are best repaired by a doubled rotated flap

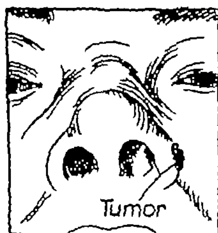
183 A tumor arising on the skin has perforated through into the nasal cavity

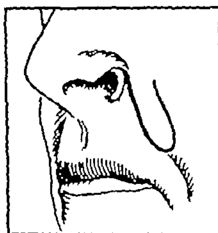
184 The tumor has been excised and the flap outlined.

185 The flap has been raised, partly rotated, and doubled.

186 After the suture has been completed the nasal cavity is packed with Vaseline gauze and a moderate *pressure dressing applied externally*



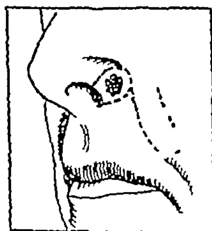




184 Excision of the tumor completed.



185 The doubled



183 A deeply invading and perforating tumor of the nasal ala and the line of incision.



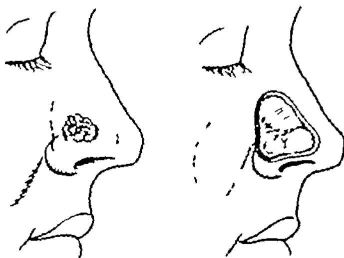
186 The completed suture.

EXCISION OF GROWTH OF NASAL ALA; CLOSURE BY ROTATED FLAP FROM CHEEK

For growths of the posterolateral aspect of the nose the defect is often best closed by rotated flap from the adjacent cheek

181 The growth is circumscribed with a safe margin and the depths of the excision may include underlying cartilage if necessary A pedicle flap of sufficient length is outlined running parallel to the nasal labial groove

182 Some undercutting and a few buried sutures may be useful in approximating the edges of the defect left after raising the skin flap



181 The excision and outline of the flap



182 Rotation of the flap and sutures.

OPERATIONS FOR CANCER OF THE SKIN OF THE FACE: NOSE (Figs. 183–186)

EXCISION OF THE FULL THICKNESS OF THE MARGIN OF THE NASAL ALA; REPAIR BY A DOUBLED ROTATED FLAP

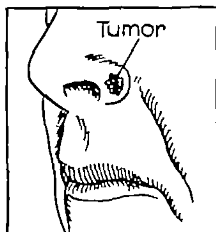
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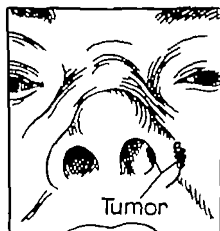
183 A tumor arising on the skin has perforated through into the nasal cavity

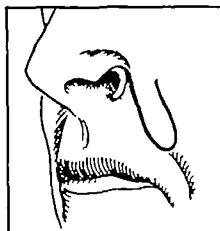
184 The tumor has been excised and the flap out lined.

185 The flap has been raised partly rotated and doubled.

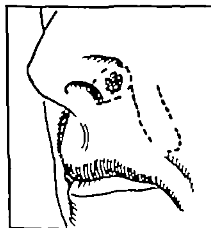
186 After the suture has been completed the nasal cavity is packed with Vaseline gauze and a moderate pressure dressing applied externally



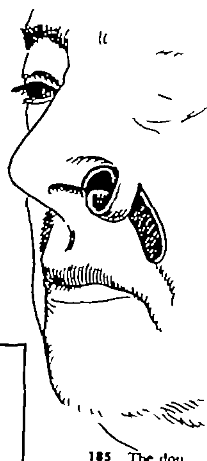




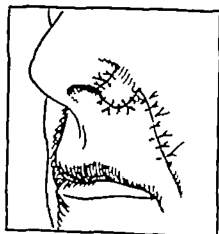
184 Excision of the tumor completed



183 A deeply invading and perforating tumor of the nasal ala and the line of incision



185 The dou



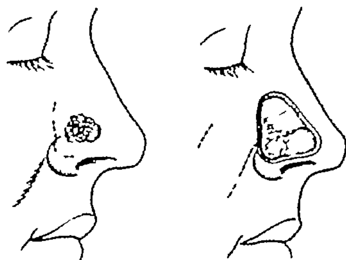
186 The completed suture.

EXCISION OF GROWTH OF NASAL ALA; CLOSURE BY ROTATED FLAP FROM CHEEK

For growths of the posterolateral aspect of the nose the defect is often best closed by rotated flap from the adjacent cheek

181 The growth is circumscribed with a safe margin and the depths of the excision may include under lying cartilage if necessary A pedicle flap of sufficient length is outlined running parallel to the nasal labial groove

182 Some undercutting and a few buried sutures may be useful in approximating the edges of the defect left after raising the skin flap



181 The excision and outline of the flap

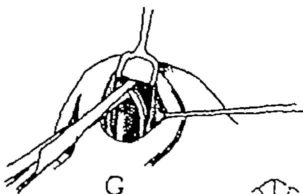


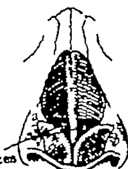
182 Rotation of the flap and sutures.

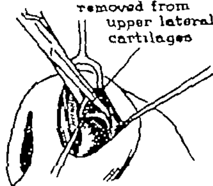
EXCISION OF GROWTH NEAR TIP OF NOSE: CLOSURE BY RHINOPLASTY CONTINUED

189 A triangular segment is removed from the per lateral cartilages (*G*, *H* *I*)

190 A flap (*J* *K*) is mobilized from the bridge the nose excising a triangular segment of skin a fat from the crease along the lateral aspect of nose The skin flap is pulled downward to close defect and the incision is closed (*L*) The columel is brought into its more elevated position by at three mattress sutures (*M*) No sutures are placed the lateral aspect of the intranasal portion of incision

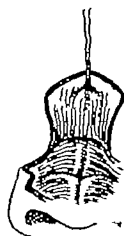




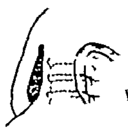


189 Excision of lateral cartilage.







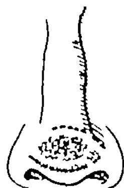


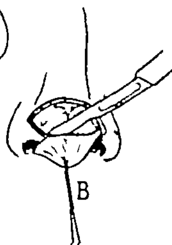
190 Mobilization and suture of sliding flaps.

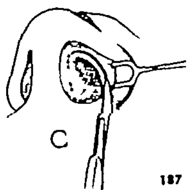
EXCISION OF GROWTH NEAR TIP OF NOSE: CLOSURE BY RHINOPLASTY

Although most small or moderate-sized defects following excision of growths of the lower bridge of the nose are most expeditiously closed by full-thickness grafts (Figs. 179 180) a fairly large wound defect can also be closed by rhinoplasty often with improvement of the former cosmetic appearance of the nose

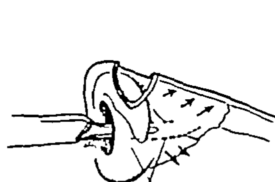
187 188 The growth is excised through a transverse ellipse (*A B*) down to and even including, if necessary a portion of the underlying cartilage Retracting the lateral aspect of the ala, the knife blade is inserted just within the nares, deep to the alar cartilage and the incision carried upward (*C D*) The incision is then carried mesially through the septal cartilage (*E*) freeing the columella A triangular segment is then removed from the septal cartilage (*F*)

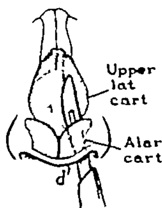


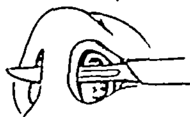


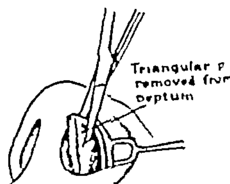


187 Excision of the growth







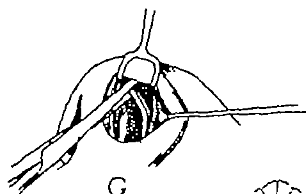


188 Mobilization of skin flaps and excision of septal cartilage

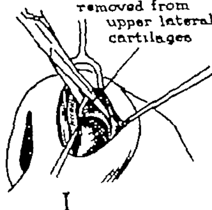
EXCISION OF GROWTH NEAR TIP OF NOSE: CLOSURE BY RHINOPLASTY CONTINUED

189 A triangular segment is removed from the per lateral cartilages (*G H I*)

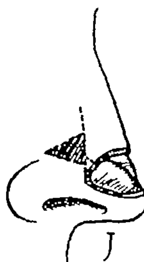
190 A flap (*J K*) is mobilized from the bridge the nose excising a triangular segment of skin ar fat from the crease along the lateral aspect of nose The skin flap is pulled downward to close defect and the incision is closed (*L*) The is brought into its more elevated position by three mattress sutures (*M*) No sutures are placed the lateral aspect of the intranasal portion of incision

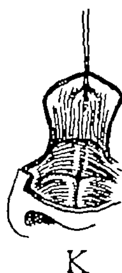






189 Excision of lateral cartilage.





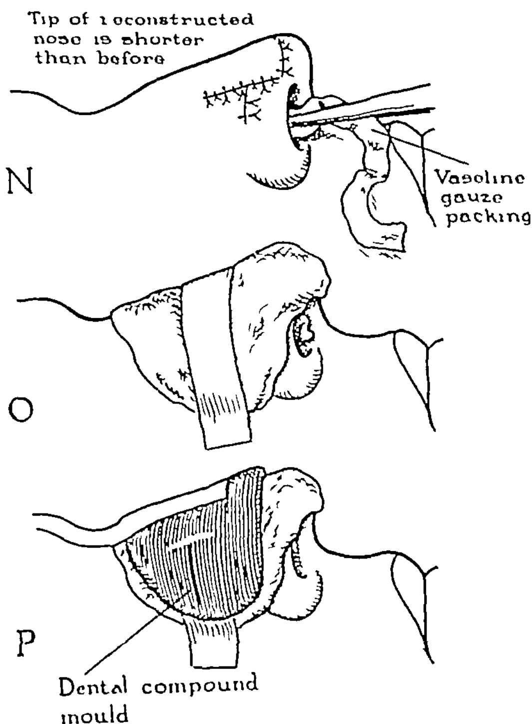




190 Mobilization and suture of sliding flaps.

EXCISION OF GROWTH NEAR TIP OF NOSE: CLOSURE BY RHINOPLASTY CONTINUED

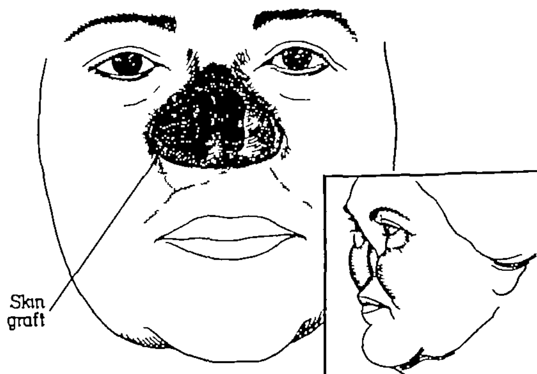
191 A Vaseline-gauze pack is placed within the nasal cavities (*N*) A gauze dressing is placed on the outer surface (*O*) A dental compound mould (*P*) is superimposed so as to effect some hemostasis by pressure between the mould and the packing within the nose.



191 Compression dressing

RADICAL EXCISION OF THE NOSE AND NASAL CAVITY FOR DEEPLY-INVASIVE CANCER OF THE SKIN OF THE NOSE

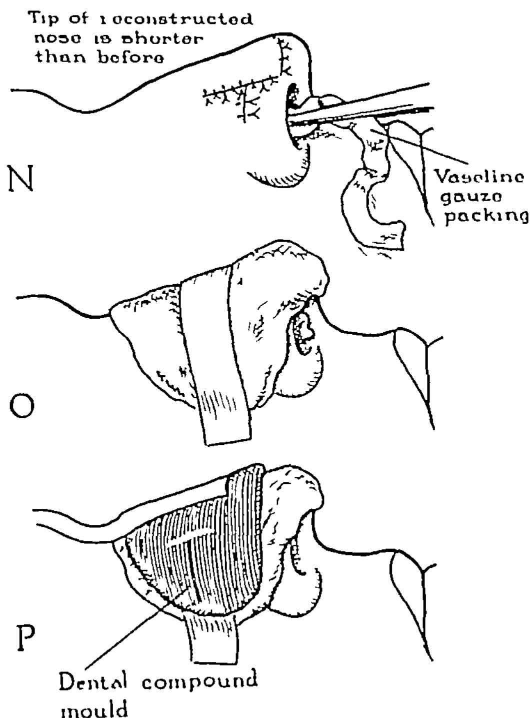
192 Following wide radical excision of the and central portions of the face, both antral mucosal linings are curetted and all raw covered with a split-skin graft. It is always risky begin closure of the defect by rebuilding the since recurrence is common, especially in cases radiation skin cancer It is prudent to deal with cosmetic defect either by covering it with a or by a prosthesis.



192 The healed wound after radical resection of nose and nasal cavity and skin grafting of the antral cavities.

EXCISION OF GROWTH NEAR TIP OF NOSE: CLOSURE BY RHINOPLASTY CONTINUED

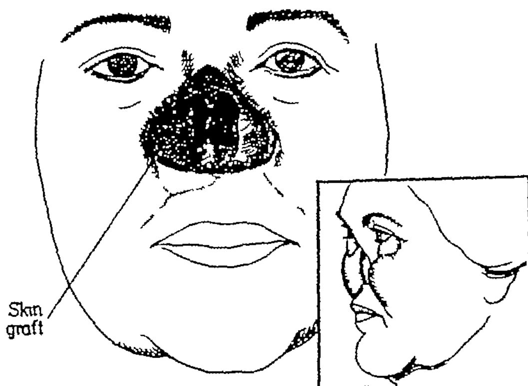
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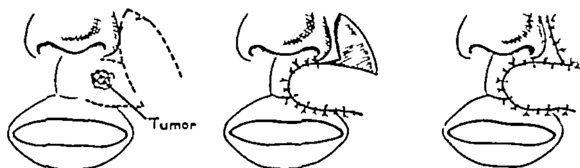
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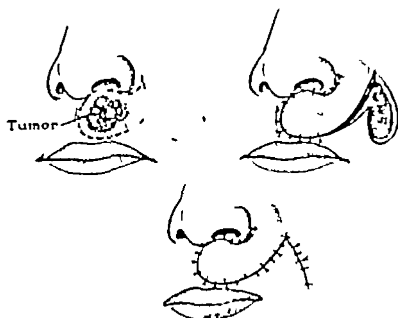
192 The healed wound after radical resection of nose and nasal cavity and skin grafting of the antral cavities.

EXCISION OF GROWTH OF THE UPPER LIP; CLOSURE BY ROTATED FLAPS

193 194 Rotated flaps for repair of defects in the skin of the upper lip should be taken parallel with the nasal labial crease whenever possible The base of the pedicle may be placed below with the tip of the flap upward for the shorter flaps or with the base upward and the tip of the flap below for longer flaps In the latter case it may be necessary to "defat" the flap at a later stage



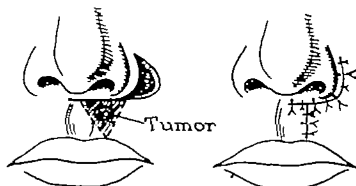
193 Rotated flap with base below



194 Rotated flap with base above

EXCISION OF GROWTH OF THE SKIN OF THE UPPER LIP; CLOSURE BY SLIDING FLAP

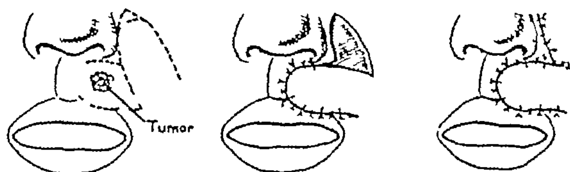
195 A simple method of closure following excision of small growths of the upper lip is a sliding flap with the addition of a crescentric shaped excision of skin lateral to the ala Such a procedure may be used bilaterally for larger defects in the midline of the upper lip



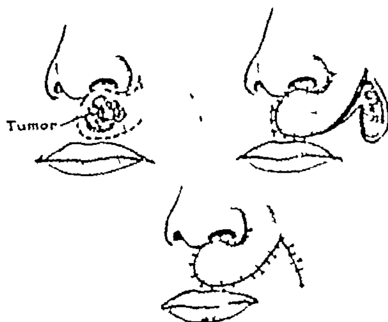
195 Sliding flap of the upper lip

EXCISION OF GROWTH OF THE UPPER LIP; CLOSURE BY ROTATED FLAPS

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193 Rotated flap with base below



194 Rotated flap with base above

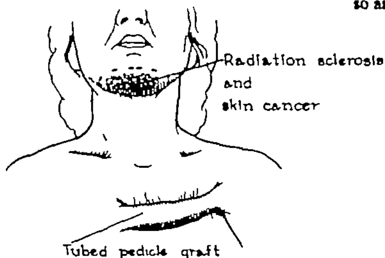
OPERATIONS FOR CANCER OF THE SKIN OF THE FACE: CHIN (Figs. 198–201)

EXCISION OF RADIATION SCLEROSIS AND CANCER OF SKIN OF CHIN AND REPAIR BY PEDICLE TUBE GRAFT

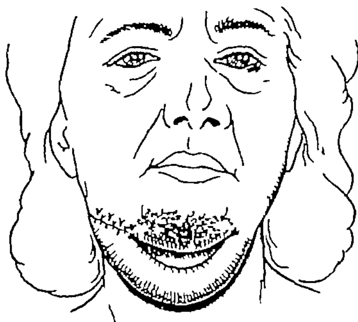
Large areas of radiation sclerosis with skin cancer of the face are not satisfactorily replaced by split grafts Full-thickness grafts are undesirable because of the doubtful "take" on the sclerosed base Probably the best form of skin replacement is by tubed pedicle grafts on the clavicular or anterior chest areas with defatting in the final stages.

198 A tubed pedicle has been formed on the anterior chest wall preparatory to migration to the region of the chin.

199 The pedicle tube has been migrated in stages so as to straddle the condemned area of skin.



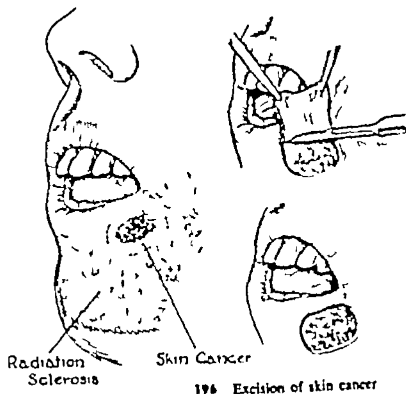
198 Dotted area indicates amount of skin to be excised.



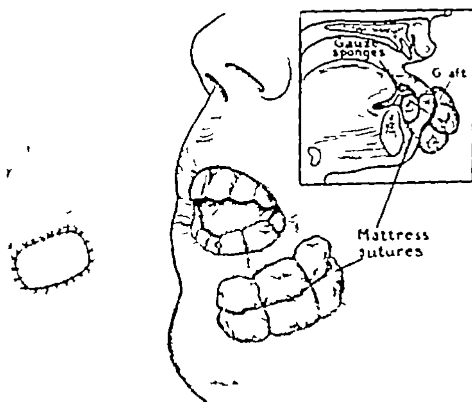
199 Intermediate stage of migration of the tube.

EXCISION OF SKIN CANCER OF LOWER LIP; CLOSURE BY SKIN GRAFT AND MATTRESS-SUTURE PRESSURE DRESSING

196 197 In cases of radiation sclerosis and skin cancer surrounding the lips full-thickness skin grafts are often indicated. Immobilization and pressure is obtained by a sandwich-type dressing and mattress sutures



196 Excision of skin cancer

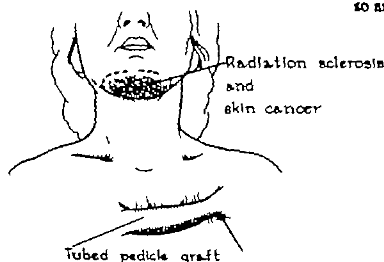


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EXCISION OF RADIATION SCLEROSIS AND CANCER OF SKIN OF CHIN AND REPAIR BY PEDICLE TUBE GRAFT

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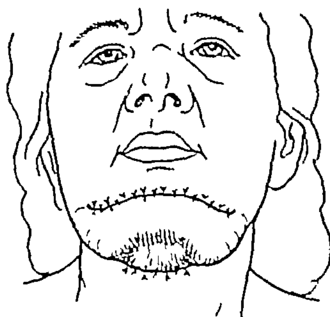


199 Intermediate stage of migration of the tu

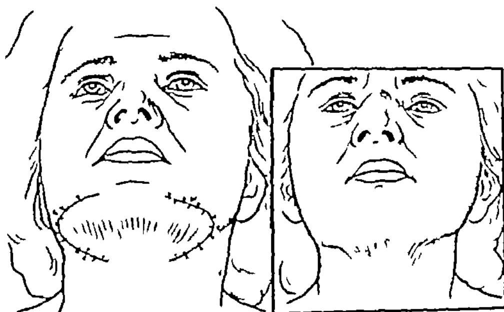
EXCISION OF RADIATION SCLEROSIS AND CANCER OF SKIN OF CHIN AND REPAIR BY PEDICLE TUBE GRAFT CONTINUED

200 An elliptical-shaped area of damaged skin over the chin has been excised, the tube opened up partly defatted, and sutured into the margins of the defect.

201 The two extremities (or flaps) have been raised, defatted and resutured



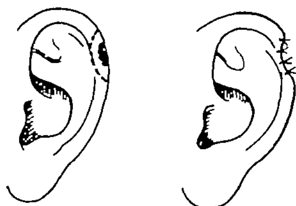
200 Replacement of skin of chin by pedicle tube



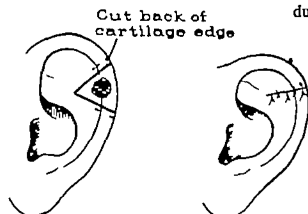
201 Defatting of the graft and the final healed appearance

EXCISION OF GROWTHS IN AND ABOUT THE AURICLE

Depending upon the exact situation and extent, the excision of growths about the ear and the closure of the resultant defects is compli cated to a varying degree by the underlying cartilage of the ear the external auditory meatus the eardrum and middle ear and the adjacent mastoid cells and temporal bone. When the growths approach or invade the middle ear the critical distances and safe mar gins tend to be narrow



202 Elliptical excision of helix.

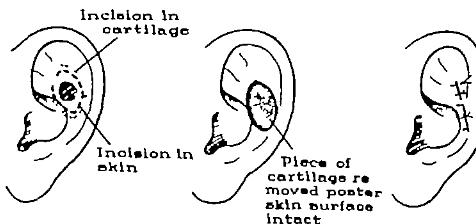


203 Wedge exci sion of helix.

202 The simplest procedure for small growths of the helix is a vertical ellipse including some underlying cartilage. The cosmetic defect is minimal.

203 For more deeply infiltrating defects of the helix a wedge-shaped excision including cartilage is required The cartilage should be cut back wider than the line of the skin incision Only a moderate change in shape of the ear results

204 For growths of the fossa of the ear an elliptical incision should be made to include a piece of the underlying cartilage cut back slightly wider than the skin incision. The resultant deformity is moderate and justifiable in view of the simplicity of the procedure



204 Elliptical excision in fossa of ear

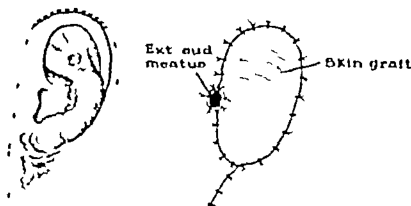
EXCISION OF GROWTHS IN AND ABOUT THE AURICLE CONTINUED

205 An effort should be made to preserve at least a small portion of the upper margin of the auricle so as to provide a projection for the riding bow of the spectacles.

206 If the growth is too extensive for any form of local excision the entire auricle should be resected and the wound covered with a split or full-thickness skin graft.



205 Partial excision of auricle



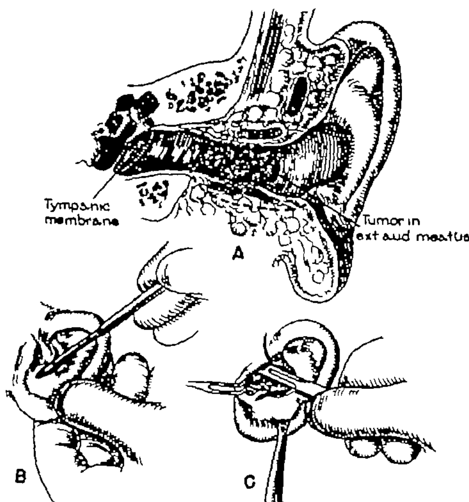
206 Total excision of auricle and split-skin graft.

EXCISION OF GROWTHS IN THE EXTERNAL AUDITORY CANAL

When cancer arises in the skin of the auditory canal a safely wide margin necessitates the removal of the underlying cartilage, during which no fear need be entertained that the drum itself will be injured if the manipulations do not deeply enter the bony external meatus A skin graft is essential. A compression dressing should be left in place for about six days until the graft has firmly adhered.

207 The line of deep incision extends to the outer rim of the bony canal, *A*

The skin incision widely circumscribes the outer limits of the tumor, and is extended above so that the ear may be retracted posteriorly for wider exposure, *B C*

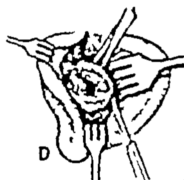


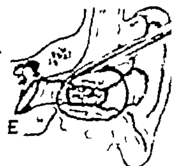
207 Excision of the growth.

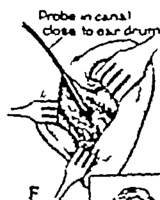
EXCISION OF GROWTHS IN THE EXTERNAL AUDITORY CANAL CONTINUED

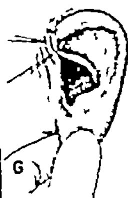
208 *Using sharp dissection the operative specimen* is mobilized, cutting across the uninvolved auditory canal at its bony meatus *D E* No fear need be entertained that the scissors will cut too deeply since the drum is situated almost a centimeter within the bony meatus.

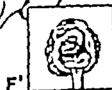
209 A split-skin graft about 5 cm in diameter is folded over to a cup shape *H* The cup-shaped graft is forced into the operative defect *I* Gauze packing is inserted within the meatus to hold the graft in apposition to its walls *J K* The outer margins of the graft are sutured to the edges of the defect and tied over a pressure dressing *L, M* A larger pressure dressing is applied over the whole ear and held in place by elastic adhesive



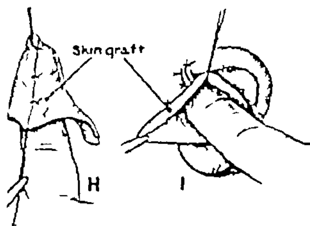


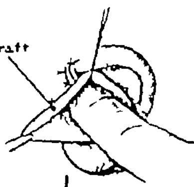






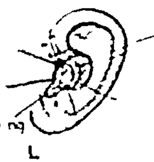
208 Excision of the growth

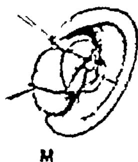












RADICAL EXCISION OF EXTERNAL AND MIDDLE EAR WITH SKIN GRAFT

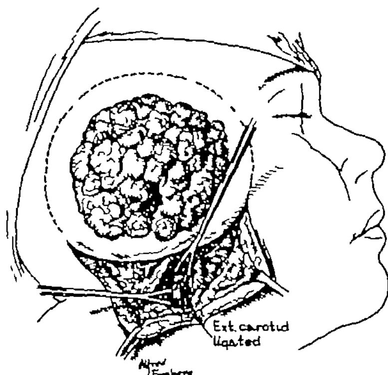
The natural history of basal cell cancer arising within the auricle is the eventual invasion of the external meatus and then the middle ear

If there is no deep extension into the inner ear the growth may be completely removed only by radical surgery of the temporal bone

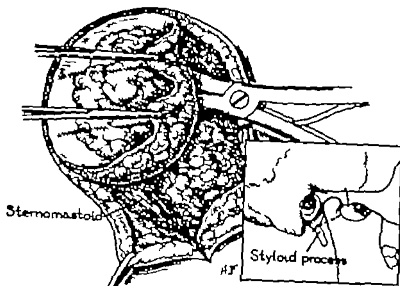
210 The growth surrounding the ear is circumscribed with a safe margin The incision and blunt dissection is carried low enough to expose the external carotid artery for ligation (See Figs 111, 112.)

211 The zygoma and coronoid and styloid processes are sectioned to mobilize the deep portion of the growth.

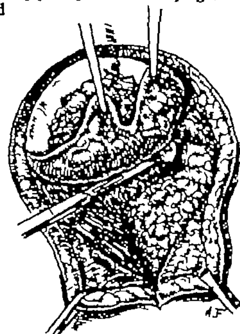
212 213 The incision is carried safely wide in the soft tissues and as deeply as possible overlying the bone of the mastoid



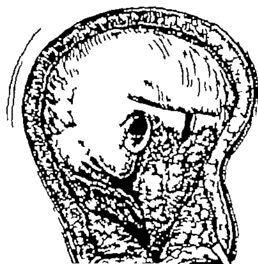
210 The skin incision and the ligation of the external carotid.



211 Excision of the superficial portion of the growth section of the zygoma and styloid and coronoid processes.



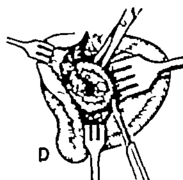
212 Excision of deeper portions of the gro

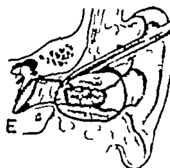


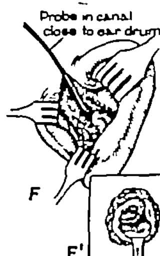
EXCISION OF GROWTHS IN THE EXTERNAL AUDITORY CANAL CONTINUED

208 Using sharp dissection the operative specimen is mobilized cutting across the uninvolved auditory canal at its bony meatus *D E* No fear need be entertained that the scissors will cut too deeply since the drum is situated almost a centimeter within the bony meatus.

209 A split-skin graft about 5 cm in diameter is folded over to a cup shape *H* The cup-shaped graft is forced into the operative defect, *I* Gauze packing is inserted within the meatus to hold the graft in apposition to its walls *J K* The outer margins of the graft are sutured to the edges of the defect and tied over a pressure dressing. *L M* A larger pressure dressing is applied over the whole ear and held in place by elastic adhesive

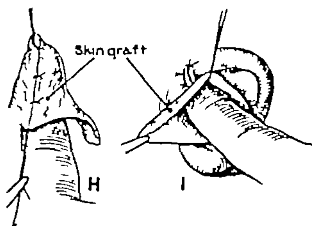


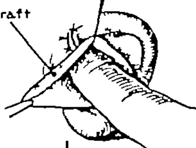


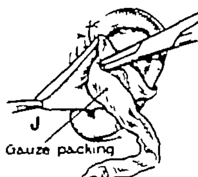


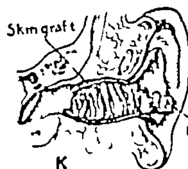


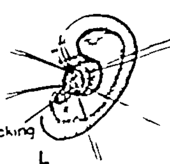
208 Excision of the growth.

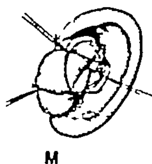






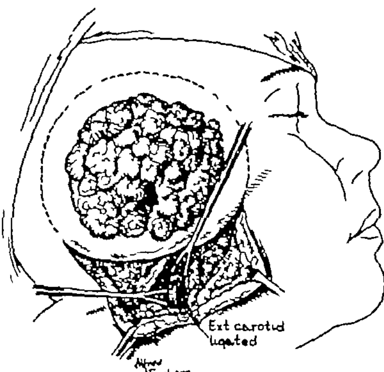




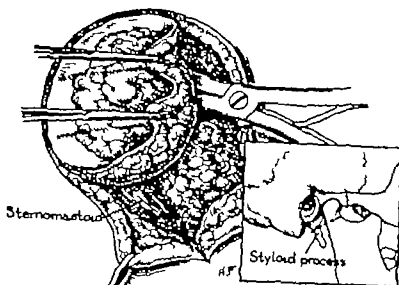


209 Application of the skin graft.

The natural history of basal cell cancer arising within the auricle is the eventual invasion of the external meatus and then the middle ear



210 The skin incision and the ligation of the external carotid



211 Excision of the superficial portion of the growth section of the zygoma and styloid and coronoid processes.

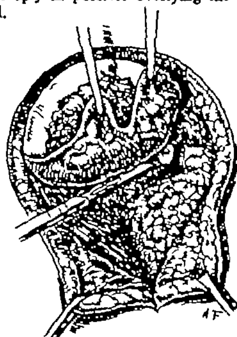
RADICAL EXCISION OF EXTERNAL AND MIDDLE EAR WITH SKIN GRAFT

If there is no deep extension into the inner ear, the growth may be completely removed only by radical surgery of the temporal bone

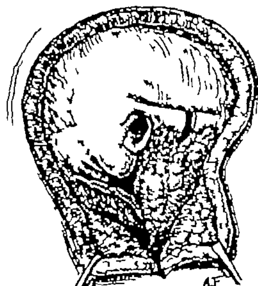
210 The growth surrounding the ear is circumscribed with a safe margin The incision and blunt dissection is carried low enough to expose the external carotid artery for ligation (See Figs 111 112)

211 *The zygoma and coronoid and styloid processes* are sectioned to mobilize the deep portion of the growth.

212 213 The incision is carried safely wide in the soft tissues and as deeply as possible overlying the bone of the mastoid.



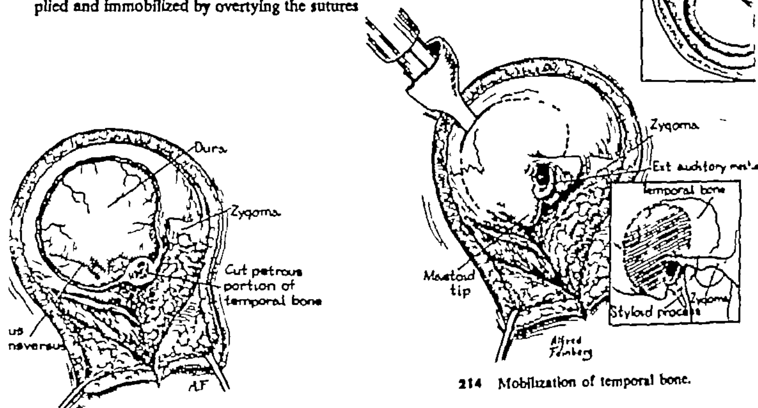
212 Excision of deeper portions of the gro



RADICAL EXCISION OF EXTERNAL AND MIDDLE EAR WITH SKIN GRAFT CONTINUED

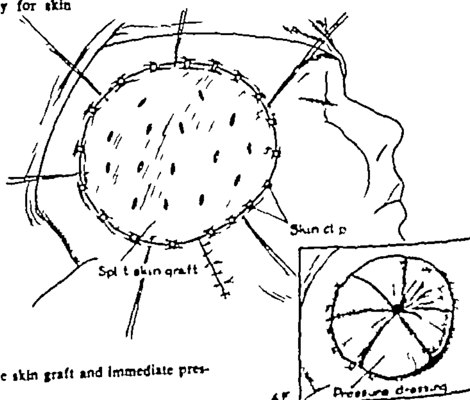
214 215 Using the vibratory saw and chisel a section of the squamous and petrous portions of the temporal bone is mobilized and the dura exposed.

216 A split thickness skin graft is sutured in place using both sutures and (to save time) skin clips. The graft itself is fenestrated A pressure dressing is applied and immobilized by overtying the sutures



The completed excision wound ready for skin

214 Mobilization of temporal bone.



216 Application of the skin graft and immediate pressure dressing

Chapter 10

OPERATIONS FOR CANCER OF THE MUCOSA OF THE LIP

Operations for cancer of the lip are of a wide variety For the smaller lesions a simple superficial ellipse is adequate and gives an almost perfect cosmetic result. A V-excision should be used only for moderately advanced lesions For more advanced cancers of the lip requiring larger V-excisions both function and appearance are improved by partial replacement of the operative defect by a flap from the opposite lip (Estlander) For the most advanced lesions requiring complete resection of the lower lip and adjacent tissues a more complicated form of cheiloplasty (Bernard) is required or the excised tissues are replaced by tubed pedicle flaps With the more extensive operations cosmetic appearance must be sacrificed to insure the optimum chance of permanent control of the growth and a reasonable functional result.

OPERATIONS FOR CANCER OF THE MUCOSA OF THE LIP (Figs 217–219)

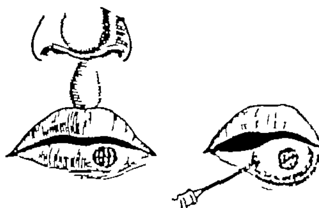
LOCAL EXCISION OF CANCER OF THE LIP BY SIMPLE ELLIPSE

For excision of small growths of the lip an anteroposterior ellipse rather than a V-excision should be used If digital pressure is made on the vermilion border the contour of the lip will be flattened and the elliptical incision can be planned exactly as if the growth were on a flat surface of the face In the average small cancer of the lip such an excision need not extend deeply into the musculature of the lip and in the healed state is cosmetically preferable to the classical V-excision.

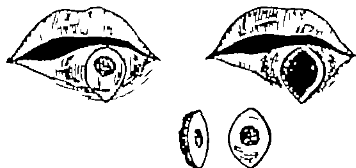
217 Local infiltration is adequate in the average case but supplementary regional anesthesia by injection at the mental foramen is useful

218 The contour of the lip in the region of the growth is flattened and a vertical elliptical incision should be made at least 5 mm from all visible and palpable borders of the growth The depth of the incision is gauged exactly as if the growth were on a flat surface of the skin of the face The classical V-excision is to be reserved for deeply infiltrating tumors

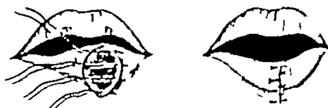
219 The incision is closed by nonabsorbable alternate vertical mattress and simple sutures



217 The primary lesion and injection of local anesthesia.



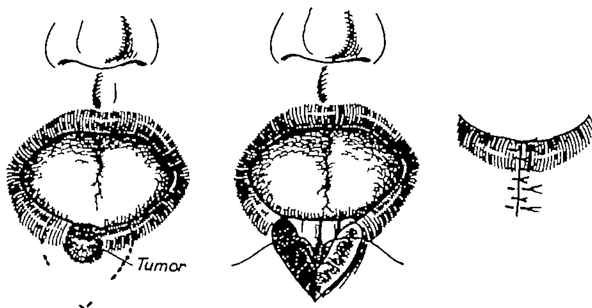
218 Elliptical excision of the growth.



219 Closure of the wound.

V-EXCISION OF LOWER LIP

220 The V-excision has been used for cancer of the lower lip With the technics available at the present day this operation in its standard form is seldom indicated. For small lesions, the anteroposterior ellipse is preferable, and for the larger lesions closure of the defect is best accomplished by an Estlander flap from the upper lip (Figs. 226–232)



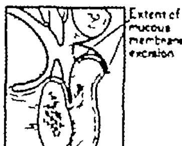
220 V-excision of cancer of the lip.

OPERATIONS FOR CANCER OF THE MUCOSA OF THE LIP (Figs 221–224)

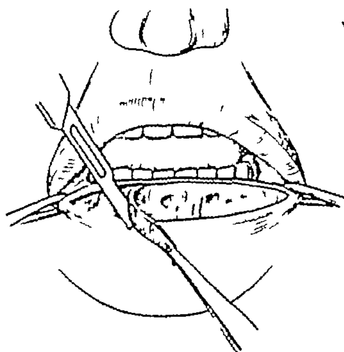
SUBTOTAL EXCISION OF MUCOSA OF THE LOWER LIP (LIP STRIPPING OPERATION)

This procedure is indicated mainly in wide spread precancerous keratosis of the lip but it may be used even when small superficial cancer is present. *The cosmetic result is excellent, the main change in appearance being that less vermilion border is exposed. In females even this slight change in appearance is corrected by the application of lipstick.*

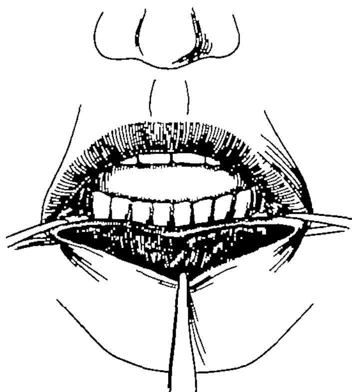
221 222 The incision is made at the mucocutaneous junction anteriorly and at a variable level posteriorly depending upon the extent of the altered mucosa. In many cases it is possible to make the entire excision superficial to the coronary vessels and orbicularis oris muscle. The excision need not be carried deeply provided there is no suspicion of malignant degeneration. In cases of superficial cancer the excision should be carried to a deeper and safer level.



221 The line of incision.



222 Excising the mucosa

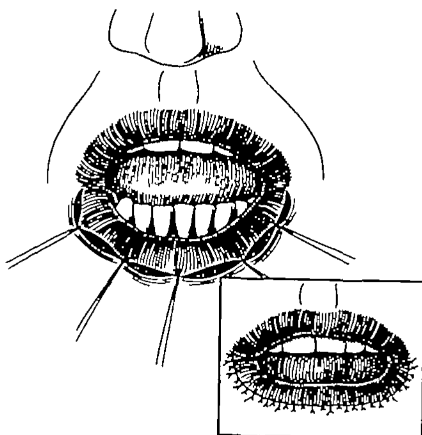


223 The wound before closure.

SUBTOTAL EXCISION OF MUCOSA OF THE LOWER LIP (LIP STRIPPING OPERATION) CONTINUED

223 The lip should be held taut by tenaculum forceps and positioned so that the procedure may be symmetrical No undercutting of the mucous membrane or the skin is necessary

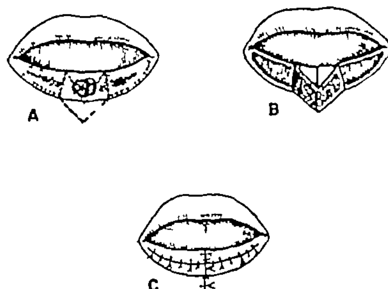
224 Several uniformly spaced stay sutures should be placed so that the closure will be uniform



224 Closure of the wound.

COMBINED V EXCISION AND LIP STRIPPING OPERATION

225 The V-excision and the lip-stripping operation may be combined in cases where there is a definite cancer of the lower lip and widespread diffuse pre cancerous changes in the rest of the mucosa



225 Combination of a V-excision with lip-stripping operation.

ESTLANDER CHEILOPLASTY

Bridged Cheiloplasty for Cancer of the Lower Lip

This operation is indicated only for growths of the upper or lower lips so extensive that an excision by a simple V would cause an unwarranted amount of deformity and disability Time will be saved by the use of general anesthesia, although the operation can be performed by a combination of nerve block and local infiltration At the narrowest point in the pedicle care should be taken that a coronary artery is kept intact. The width of the vermilion border at this point may be reduced to less than 1 cm and the flap rotated 180° without risk of inadequate circulation. In suturing no raw surface should be left at any point



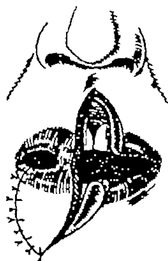
226 The incisions.

226 A shield-shaped excision (rather than the V) of the growth is made at least 5 mm wide of any visible or palpable border of the growth The site of the proposed pedicle flap is selected from the upper lip usually from the midline or from the contralateral side The proposed flap should be about two thirds the size of the operative defect.

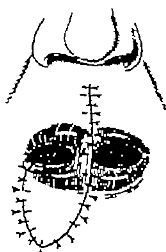
227 The pedicle at the vermilion border may be quite narrow provided that it contains a coronary artery intact. Closure is begun at the tip on the mucous surface

228 The completed closure should leave no raw surface.

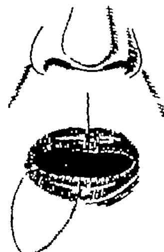
229 After a period of about a month to five weeks, the pedicle is cut through and the resulting wounds closed.



227 Rotation of the flap and beginning suture.



228 The completed closure.



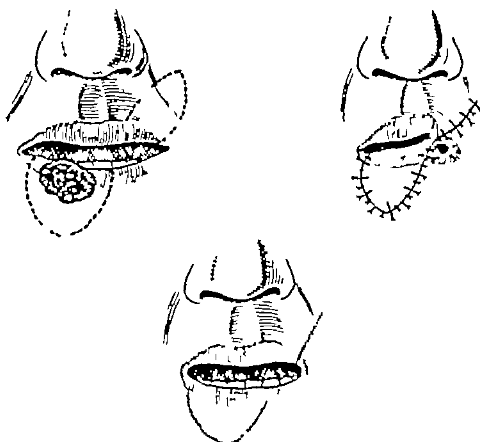
229 The appearance after severin the bridge.

ESTLANDER CHEILOPLASTY CONTINUED

Bridged Cheiloplasty for Cancer of the Lower Lip continued

Variation of Technic

230 A contralateral rather than a centrally placed pedicle transplant may be required for larger defects.



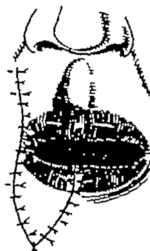
230 Contralateral Estlander flap

ESTLANDER CHEILOPLASTY CONTINUED

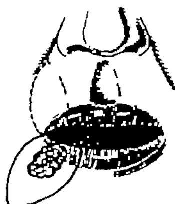
Homolateral Nonbridged Estlander Cheiloplasty

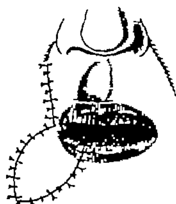
231 232 When the primary growth is at or very near the labial commissure consideration may be given to a homolateral pedicled transplant forming a new commissure, and thereby avoiding the intermediate step of a bridged pedicle The disadvantage to this procedure is that the new commissure is not so satisfactory cosmetically as it is with the bridged pedicle





231 Nonbridged Estlander flap





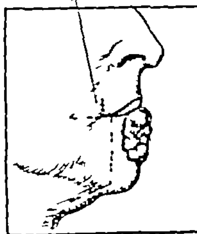
232 Nonbridged Estlander flap.

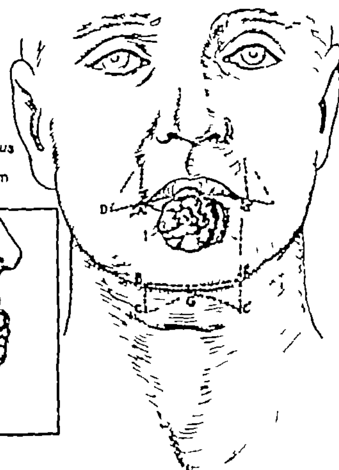
OPERATIONS FOR CANCER OF THE MUCOSA OF THE LIP (Figs. 233–236)

BERNARD CHEILOPLASTY FOR ADVANCED CANCER OF THE LOWER LIP

This operation is for growths of the lower lip too extensive for either a simple V-excision or any other form of cheiloplasty The entire lower lip and chin may have to be excised and the resulting defect is then closed by lateral cheek flaps to form a new lower lip In order to set back the commissures and to prevent great mouth deformity (fish mouth) triangles are excised from both sides of the upper lip preserving the mucous membrane to help form a new vermilion border The operation should not be combined with a neck dissection at the same stage.

233 The incisions *A–B* and *A′–B′* downward from the vermilion border should be placed at least 1 cm beyond any visible or palpable evidence of the disease. The rectangle formed by *A–B* and *a′–b* outlines the first mass of tissue excised. The lines of incision are lengthened from *B* to *C* and from *b* to *c′* note that these incisions appear as straight lines when viewed from the front but are curved posteriorly when viewed from the side The flap (*C–B b–c′*) so formed is left attached until the end of the operation when it is trimmed (*C–G c′–G*) to fit the triangular defect which remains in the submental region Triangular areas *D–E–F* of skin (not including mucosa) are excised so as to permit of lengthening the newly formed lower lip





233 The incisions.

BERNARD CHEILOPLASTY FOR ADVANCED CANCER OF THE LOWER LIP *continued*

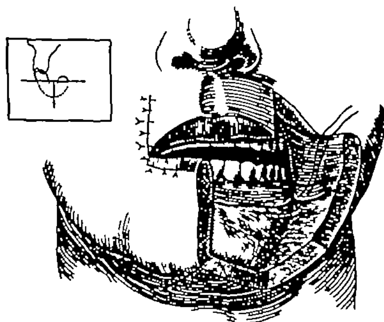
234 Diagrammatic representation of all tissue excised during the operation. On the right side of the face the mucous surface of the Bernard's triangle is shown attached at its base ready to be trimmed to form a new vermilion border On the left this has already been done

235 A schematic representation of complete closure on the right side and beginning the closure of the *mucous membrane in the gingivobuccal gutter on the left.*

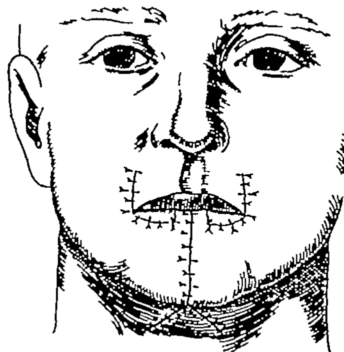
236 Closure complete Note the inverted-Y appearance of closure in the submental region where the scar is least visible

Mucous membrane flap to cover new portion of lower lip

234 The excision completed.



235 The closure of the wound.



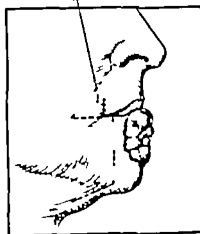
236 The closure completed.

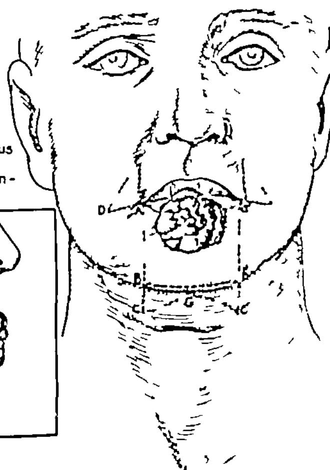
OPERATIONS FOR CANCER OF THE MUCOSA OF THE LIP (Figs 233–236)

BERNARD CHEILOPLASTY FOR ADVANCED CANCER OF THE LOWER LIP

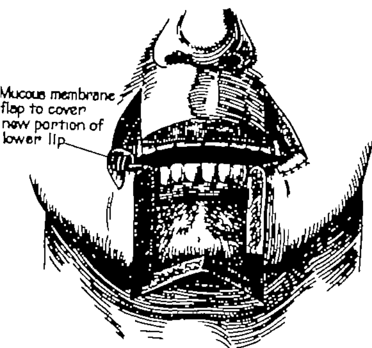
This operation is for growths of the lower lip too extensive for either a simple V-excision or any other form of cheiloplasty The entire lower lip and chin may have to be excised and the resulting defect is then closed by lateral cheek flaps to form a new lower lip In order to set back the commissures and to prevent great mouth deformity (fish mouth) triangles are excised from both sides of the upper lip preserving the mucous membrane to help form a new vermilion border The operation should not be combined with a neck dissection at the same stage

233 The incisions *A–B* and *A'–B'* downward from the vermilion border should be placed at least 1 cm beyond any visible or palpable evidence of the disease The rectangle formed by *A–B* and *a'–b* outlines the first mass of tissue excised The lines of incision are lengthened from *B* to *C* and from *b* to *c'* note that these incisions appear as straight lines when viewed from the front but are curved posteriorly when viewed from the side The flap (*C–B b–c'*) so formed is left attached until the end of the operation when it is trimmed (*C–G c'–G*) to fit the triangular defect which remains in the submental region. Triangular areas *D–E–F* of skin (not including mucosa) are excised so as to permit of lengthening the newly formed lower lip





233 The incisions.



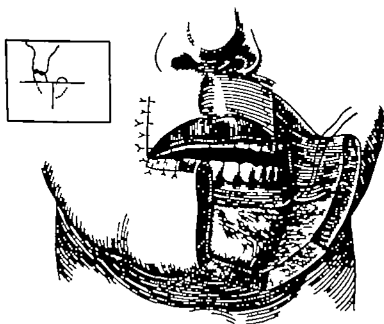
234 The excision completed.

BERNARD CHEILOPLASTY FOR ADVANCED CANCER OF THE LOWER LIP CONTINUED

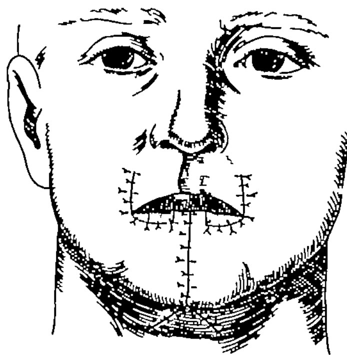
234 Diagrammatic representation of all tissue excised during the operation On the right side of the face the mucous surface of the Bernard's triangle is shown attached at its base ready to be trimmed to form a new vermilion border On the left this has already been done

235 A schematic representation of complete closure on the right side and beginning the closure of the mucous membrane in the gingivobuccal gutter on the left.

236 Closure complete Note the inverted Y appearance of closure in the submental region where the scar is least visible.



235 The closure of the wound

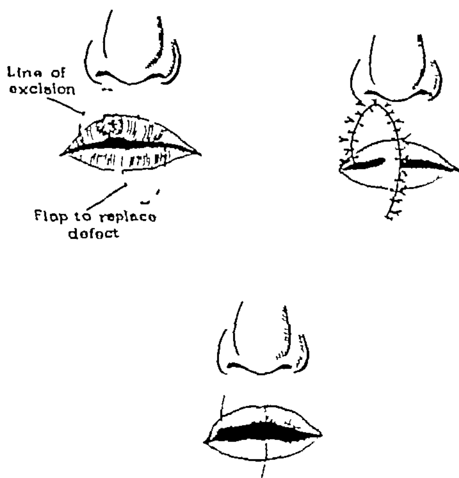


236 The closure completed.

OPERATIONS FOR CANCER OF THE MUCOSA OF THE LIP (Fig 237)

BRIDGED ESTLANDER CHEILOPLASTY FOR CANCER OF THE UPPER LIP

237 The flap from the lower lip should be taken from the midline if possible and rotated through an arc of 180° The procedure is similar to that shown in Figs 226–229

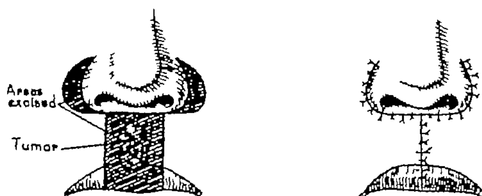


237 Reverse Estlander cheiloplasty

CHEILOPLASTY FOR CANCER OF THE UPPER LIP: CLOSURE BY BILATERAL SLIDING FLAPS

238 Vertical incisions equidistant from the midline are carried through into the gingivobuccal gutter and the lateral flaps developed by extending the incisions horizontally in the respective gingivobuccal gutters The crescent shaped areas of skin and subcutaneous fat are excised lateral to the ala to permit approximation.

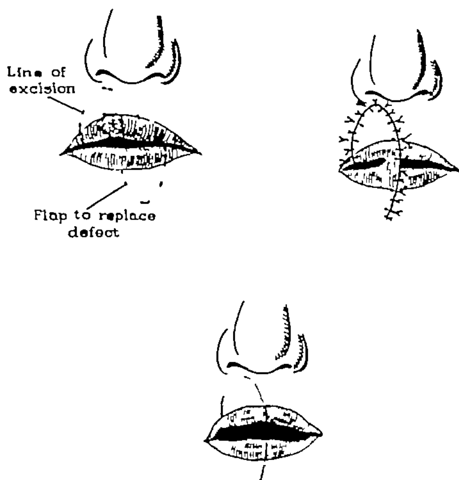
(Note The same procedure of the crescentric-shaped incision lateral to the ala has already been described for skin cancer in Fig. 195)



238 Excision of the tumor and plastic closure

BRIDGED ESTLANDER CHEILOPLASTY FOR CANCER OF THE UPPER LIP

237 The flap from the lower lip should be taken from the midline if possible and rotated through an arc of 180° The procedure is similar to that shown in Figs. 226–229



237 Reverse Estlander cheiloplasty

CHEILOPLASTY FOR CANCER OF THE UPPER LIP CLOSURE BY BILATERAL SLIDING FLAPS

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(Note The same procedure of the crescentric-shaped incision lateral to the ala has already been described for skin cancer in Fig. 195)



238 Excision of the tumor and plastic closure.

Chapter 11

OPERATIONS FOR CANCER OF THE MUCOSA OF THE CHEEK

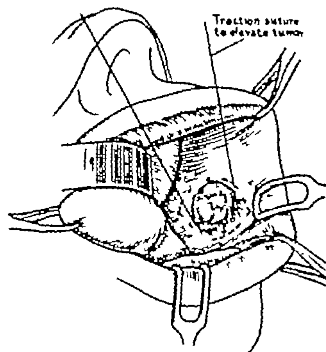
While the tissues of the cheek are highly elastic, growths arising in the mucous membrane tend to invade the thin layer of underlying tissues fairly early Attempts at safely wide removal of growths in this area run the risk both of failure to get deep enough without perforating the skin of the cheek or (by reason of the scarring) of restricting the opening of the mouth On the other hand, the more elaborate procedures, such as skin grafting or transposition of flaps within the mouth, or through-and through removal may run the risk of partial failure or of necessitating multiple operations Simple excision and closure, if suitable are therefore preferable to the more elaborate procedures.

OPERATIONS FOR CANCER OF THE MUCOSA OF CHEEK (Figs 239–241)

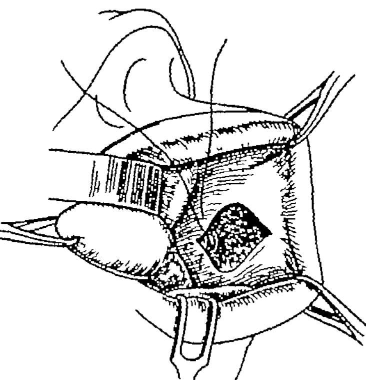
LOCAL EXCISION OF CANCER OF MUCOSA OF CHEEK AND CLOSURE BY SIMPLE SUTURE

239 The line of incision should include a reasonably safe margin of normal tissue The ellipse should be on a horizontal line if possible A traction suture is useful to elevate and mobilize the specimen.

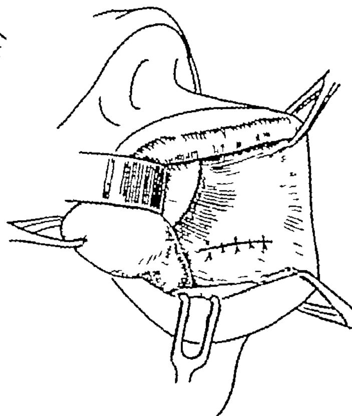
240 241 The incision is closed by alternate vertical mattress and superficial sutures.



239 The incision

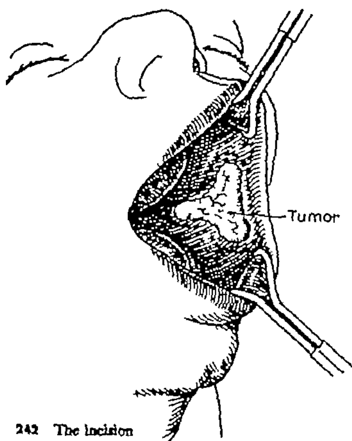


240 Closure of the incision.



241 Completed closure

OPERATIONS FOR CANCER OF THE MUCOSA OF CHEEK (Figs. 242–243)

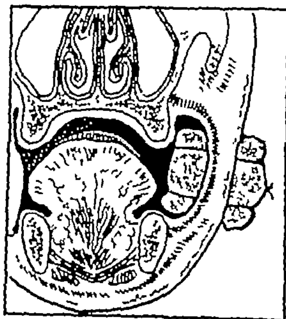


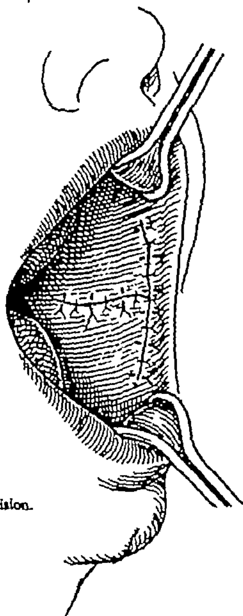
242 The incision

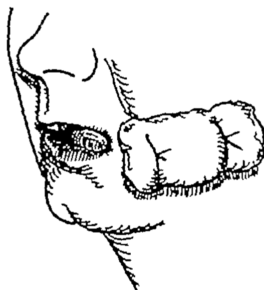
Irregularly-Shaped Excision of Cancer of Mucosa of Cheek

242 Precancerous leukoplakia of the cheek may be irregular in shape, calling for irregular forms of excisions The line of incision should follow the borders of the excision.

243 Closure of the incision may require undercutting of the edges A sandwich-type dressing held by mattress sutures will prevent formation of hematoma.







243 Closure of the incision.

OPERATIONS FOR CANCER OF THE MUCOSA OF CHEEK (Figs. 244–248)

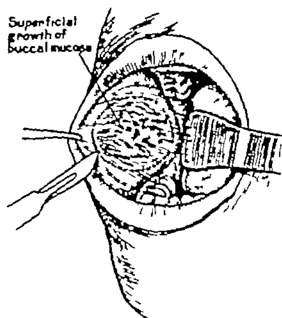
EXCISION OF TUMOR OF THE MUCOSA OF THE CHEEK CLOSURE BY SKIN GRAFT

Widespread superficial cancer often com bined with precancerous leukoplakia may re quire so wide excision of the cheek mucosa as to preclude closure by simple approximation and skin grafting may be indicated Because the tissues of the cheek are in a completely relaxed state when the mouth is closed split skin grafts tend to shrink and result in the formation of localized pockets with marked re striction in the ability to open the mouth. With full thickness grafts there is a greater chance of failure to "take" but once healed the danger of shrinkage is much less.

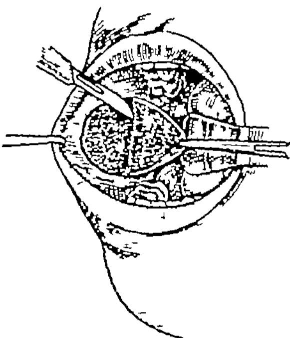
244 The line of incision should be made at a generous distance from the border of the lesion provided that room enough is left in the upper and lower gingivobuccal gutters for suturing of the skin graft. No particular attention need be paid to the position of the parotid duct.

245 The depth of the excision should be gauged by the extent of infiltration If the depth of the infiltration approaches the subcutaneous tissues of the cheek this operation is contraindicated. The parotid duct is excised

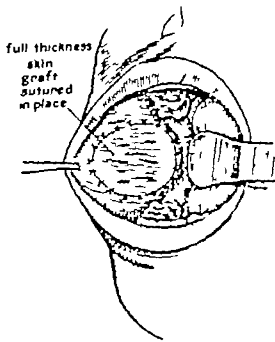
246 A full-thickness skin graft taken from the clavicular area or inner surface of the upper arm or a thick split graft from the abdomen, should be sutured in place Sufficient stab wounds should be made through the graft to prevent the accumulation of serum



244 The incision.

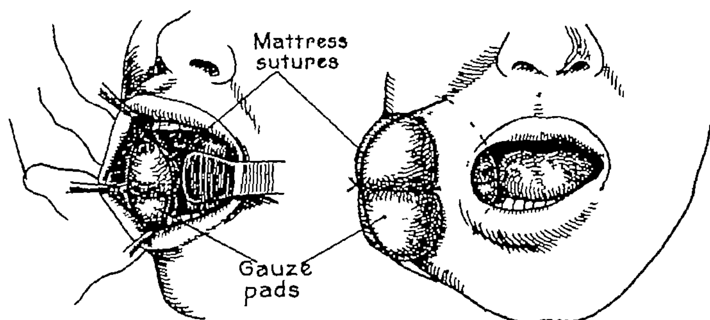


245 The excision of the specimen.

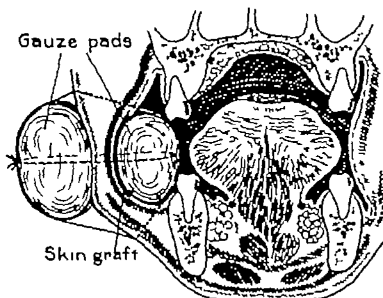


EXCISION OF TUMOR OF THE MUCOSA OF THE CHEEK: CLOSURE BY SKIN GRAFT CONTINUED

247 248 The graft is held in place by gauze packs both within the mouth and on the surface of the cheek and held in place by mattress sutures.



247 The application of sandwich-type dressing.



248 The application of sandwich-type dressing.

OPERATIONS FOR CANCER OF THE MUCOSA OF CHEEK (Figs 249–256)

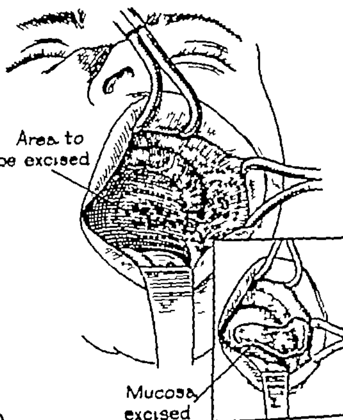
EXCISION OF WIDESPREAD MULTIPLE CANCER OR PRECANCER OF THE MUCOSA OF THE CHEEK LIPS GUM AND PALATE CLOSURE BY SKIN GRAFT ON PROSTHESIS AND ON BURIED STENTS

With superficial lesions involving widespread areas of the mucosa of the cheeks and adjacent structures staged operations employing skin *grafts on buried stents or surface stents may be* performed Such procedures have the disadvantage of necessitating a great deal of time and hospital expense

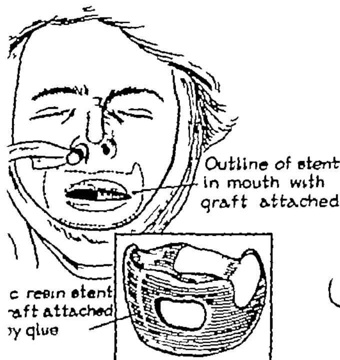
249 In most cases the lesions are superficial and the excision need not be deep The periosteum is left over the bone and the alveolus

250 A split-skin graft is glued to a specially made stent

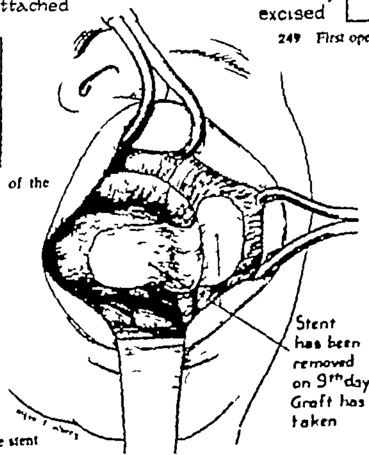
251 When the stent is removed 8 to 10 days later *the graft should have taken*



249 First operation the incision



rst operation stage 1 The application of the t.

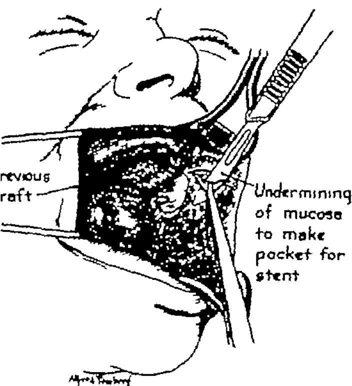


251 First operation removal of the stent

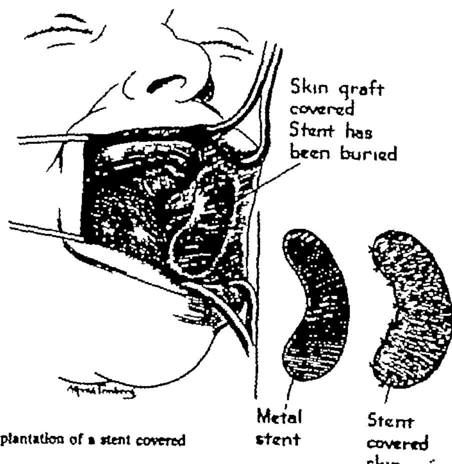
EXCISION OF WIDESPREAD MULTIPLE CANCER OR PRECANCER OF THE MUCOSA OF THE CHEEK, LIPS GUM AND PALATE: CLOSURE BY *SKIN GRAFT ON PROSTHESIS AND ON* BURIED STENTS CONTINUED

252 The area of cheek mucosa is undermined to make a pocket for introduction of a stent

253 The metal stent is covered by a full-thickness graft (raw surface out) and introduced into the pocket and the incision closed.



52 Second operation forming pocket for buried stent



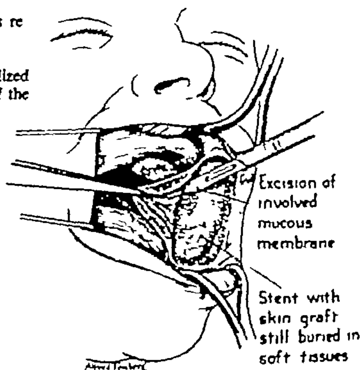
253 Second operation implantation of a stent covered by full-thickness skin graft.

EXCISION OF WIDESPREAD MULTIPLE CANCER OR PRECANCER OF THE MUCOSA OF THE CHEEK LIPS GUM AND PALATE. CLOSURE BY SKIN GRAFT ON PROSTHESIS AND ON BURIED STENTS CONTINUED

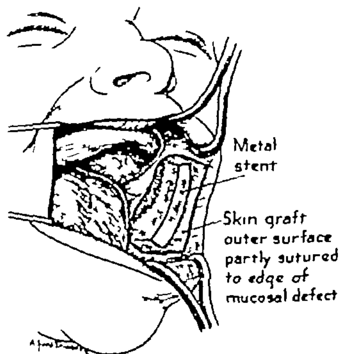
254 The mucosa is excised down to the level of the skin graft over the stent

255 An incision is made over the stent for its removal laying back flaps of the buried skin graft

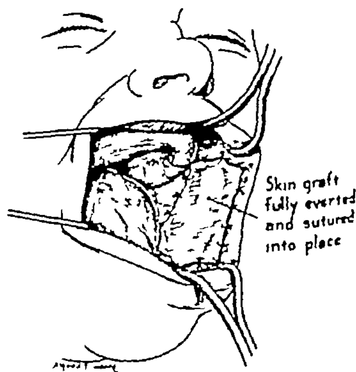
256 After removal of the stent the immobilized flaps of the skin graft are sutured to the edge of the mucosal defect.



254 Third operation excision of the specimen.



Third operation removal of the stent



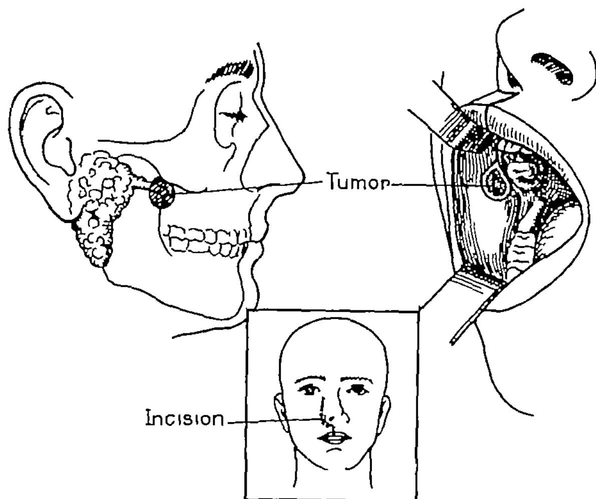
256 Third operation suture of the flaps of the skin graft

OPERATIONS FOR CANCER OF THE MUCOSA OF CHEEK (Figs. 257–258)

EXCISION OF POSTEROSUPERIOR BUCCAL TUMORS THROUGH WEBER-FERGUSSON APPROACH

In tumors of the cheek mucosa which involve also the upper gingivobuccal gutter the surgical access is difficult, and skin grafts are neither suitable nor necessary Access to these lesions is best obtained by the use of a Weber Fergusson incision

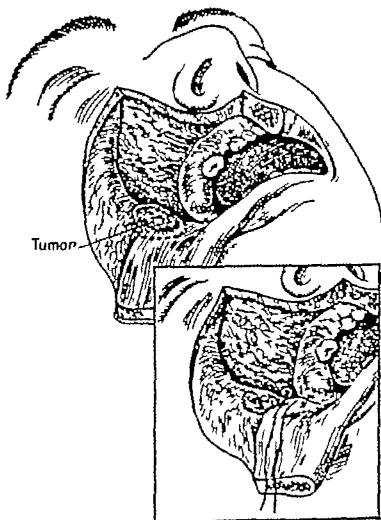
257 Exposure and access to the tumor is obtained by a modified Weber Fergusson incision splitting the upper lip and continuing the incision up toward the anterior commissure



257 The incision.

EXCISION OF POSTEROSUPERIOR BUCCAL TUMORS THROUGH WEBER-FERGUSSON APPROACH CONTINUED

258 With the cheek flap reflected, the lesion is clearly exposed and may be excised by an adequately wide and deep margin. No particular attention need be given to the parotid duct. Closure is readily effected by approximation of the edges



258 Excision of the growth.

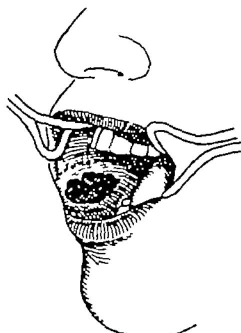
THROUGH-AND-THROUGH EXCISION OF CANCER OF THE CHEEK AND CLOSURE BY ESTLANDER FLAP

In growths of the anterior cheek mucosa which deeply invade the underlying tissues a through-and-through excision may be required, and the defect is often best closed by transposition of an Estlander flap by a technic similar to that used in cancer of the lip (Figs. 231–232)

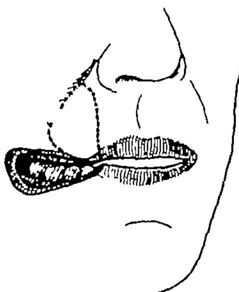
259 Since the growth usually arises on the mucosa the incision within the mouth should be wider than that of the skin

260 After through and-through excision of the growth an Estlander flap is outlined to lie fairly parallel to the nasolabial groove Care should be taken that one of the larger components of the coronary artery is left intact.

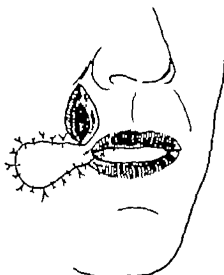
261 262 Closure is begun on the mucosal surface of the flap leaving the upper-lip defect until last.



259 The incision.



260 Excision of the growth a outlining of the Estlander flap



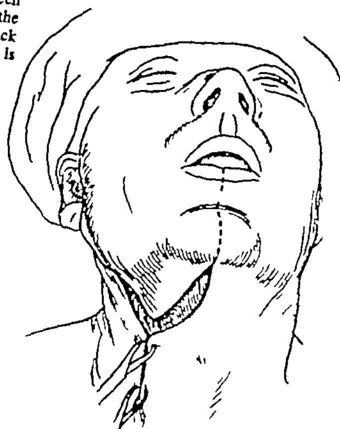
261 Transposition of the Est lander flap.

OPERATIONS FOR CANCER OF THE MUCOSA OF CHEEK (Figs 263–273)

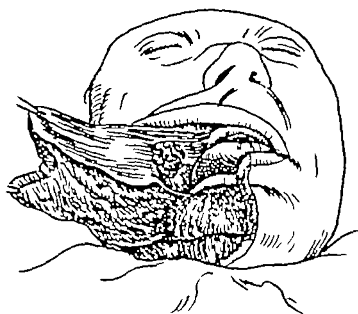
EXCISION OF DEEPLY-INFILTRATING TUMOR OF THE BUCCAL MUCOSA COMBINED WITH NECK DISSECTION ACCESS TO THE CHEEK BY SPLITTING THE LOWER LIP

Excision of cancer of the cheek mucosa may be combined with neck dissection splitting the lower lip as in the routine *Commando* approach The resultant defect in the mucosa is best repaired by an excision of the gum, extracting teeth if necessary and shifting the adjacent floor of the mouth up to the cheek mucosa.

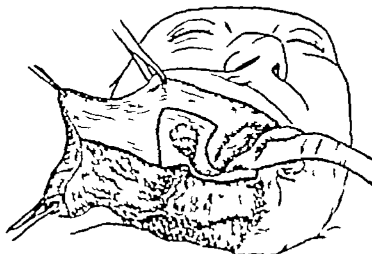
263 264 265 A neck dissection having been completed, the incision is continued up to split the lower lip in the midline The cheek flap is laid back to expose the primary lesion of the cheek which is circumscribed by an extension of the incision



263 The incision.



264 Exposure of the buccal lesion.



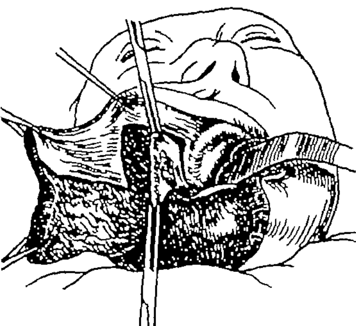
265 Incision to circumscribe the buccal lesion.

EXCISION OF DEEPLY-INFILTRATING TUMOR OF THE BUCCAL MUCOSA COMBINED WITH NECK DISSECTION ACCESS TO THE CHEEK BY SPLITTING THE LOWER LIP CONTINUED

266 The excision in its depth will always include Stenson s duct No precautions are necessary to locate the duct Its presence may be safely disregarded in the subsequent repair

267 268 In order to shift the tongue and floor of the mouth up into the operative defect of the cheek it is necessary to detach and excise the mucous membrane of the adjacent gum

269 The edge of the mucosa and the floor of the mouth are sutured into the buccal defect At least two layers of chromic buried sutures are used to approximate the soft parts underlying the mucous membrane.

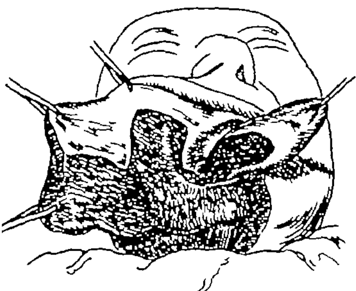


266 Excision of the primary lesion.



268 Beginning the closure.

Layered closure
of soft parts



267 Shifting of the tongue and floor of mouth to assist in closure.

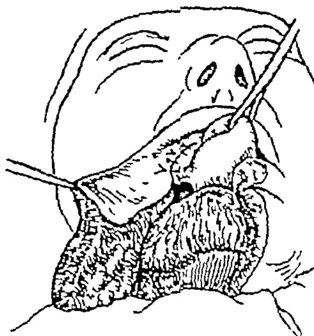
269 Layered closure of soft parts.

EXCISION OF DEEPLY-INFILTRATING TUMOR OF THE BUCCAL MUCOSA COMBINED WITH NECK DISSECTION: ACCESS TO THE CHEEK BY SPLITTING THE LOWER LIP CONTINUED

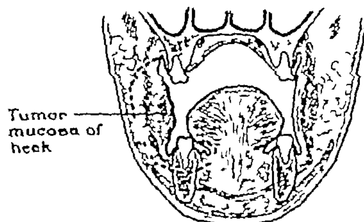
270 *If teeth are present these must be extracted and the alveolar process smoothed down in order to permit a shift of the tongue and floor of the mouth.*

272 The tongue and floor of the mouth have been shifted into the defect so that there is complete closure of the wound within the oral cavity

273 The *musculature* of the tongue is brought up for *apposition* to the defect of the cheek and the *mucosa closed.* The diagram shows a marked distortion of the tissues but in the healed state the elastic tissues stretch so that the tongue assumes a fairly normal position and no great disability follows except the loss of the power of mastication.



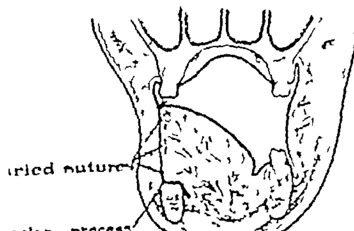
270 Continuing closure of mucosa.



271 Coronal section of the depth of the excision.



272 Completed closure except for that of neck d...tion.

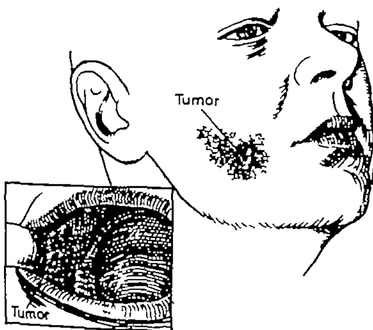


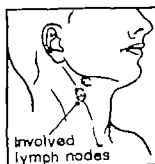
THROUGH-AND-THROUGH EXCISION OF ADVANCED DEEPLY-INFILTRATING CANCER OF THE CHEEK COMBINED WITH NECK DISSECTION

When a growth in the mucosa of the cheek deeply infiltrates the underlying tissues to involve the skin, a through-and-through excision may be required, combined with neck dissection if cervical metastases are palpable The large resultant cheek defect is closed later by advancement of tubed pedicles

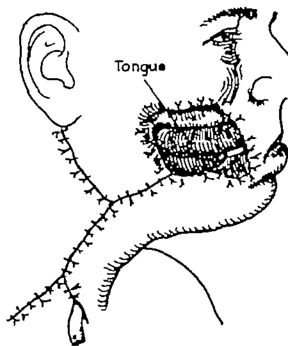
274 Unsuccessfully irradiated cancer of the mucosa of the cheek often deeply invades the tissues of the cheek and the alveolar process and metastasizes to the cervical lymph nodes

275 Radical neck dissection has been performed and the cheek (including the alveolar process) widely excised The raw surfaces of the cheek wound have been covered by suturing skin to the mucosa. (Note For method of closure by tubed pedicle flaps see 133–138)





274 Preoperative clinical setting.



275 Extent of the operative procedure.

Chapter 12

OPERATIONS FOR CANCER OF THE GUM

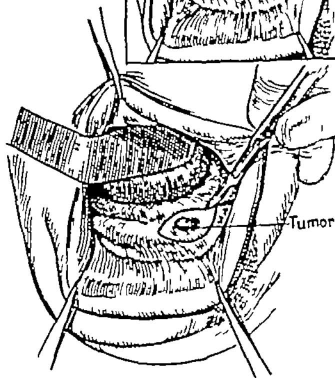
LOCAL EXCISION OF A SMALL CANCER OF THE EDENTULOUS GUM

A safely wide excision of cancer of the gum always necessitates the removal of some underlying bone. In small lesions after excision of the soft tissue a margin of bone can be removed by rongeur In more extensive lesions, at least a marginal excision of the alveolar process is required, and in some advanced growths (often involving adjacent tissues) a partial resection of the mandible must be made, usually combined with neck dissection.

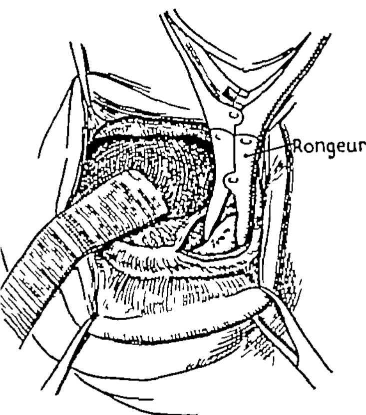
276 In an edentulous patient an elliptical-shaped incision is made adequately wide of the tumor and carried down to the alveolar process The soft tissue mass is excised

277 In order to care for possible invasion of the alveolar process and to promote soft tissue closure, the alveolar process is removed locally by rongeur





276 The incision

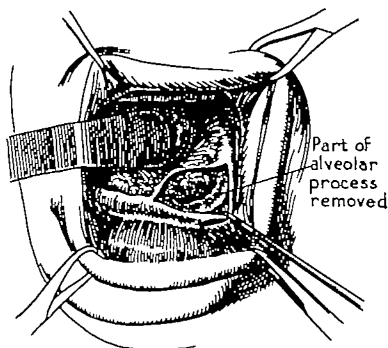


277 Alveolectomy

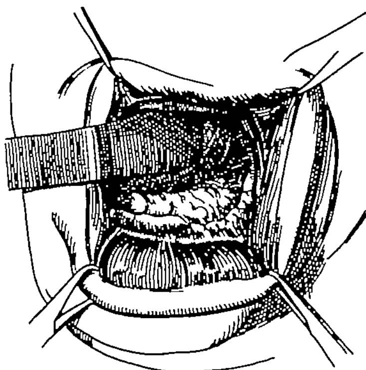
LOCAL EXCISION OF A SMALL CANCER OF THE EDENTULOUS GUM CONTINUED

278 Following partial removal of the alveolar process, the soft tissues may be approximated

279 The incision is closed by a single layer of interrupted sutures.



278 Wound before closure.

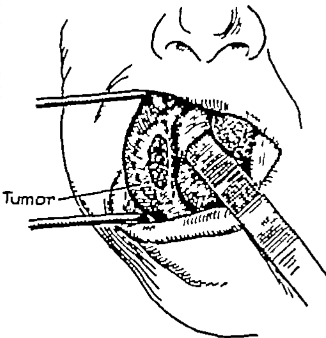


279 Completed closure of the wound.

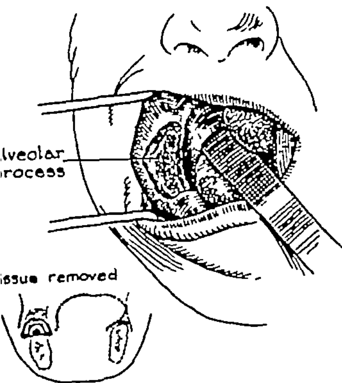
EXCISION OF CANCER OF GUM AND CLOSURE BY LATERAL SHIFTING OF FLOOR OF MOUTH

280 281 The operation is most often confined to small growths of the posterior lower gum The tumor is circumscribed by an anteroposterior ellipse and the growth with part of the underlying alveolus is excised

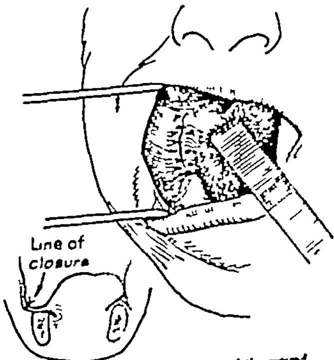
282 With a fairly wide excision of soft parts, the adjacent tongue and floor of the mouth are shifted across and sutured to the mucosa of the cheek.



280 The lesion



281 The wound after the excision.



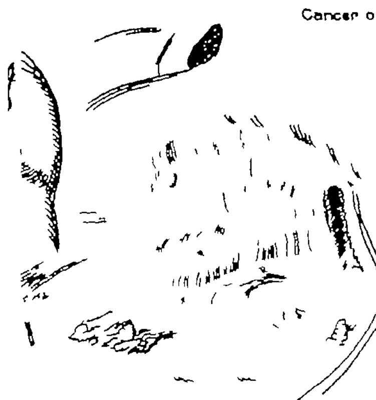
282 Closure of the wound

MARGINAL RESECTION OF MANDIBLE (ALVEOLAR PROCESS) FOR CANCER OF THE GUM

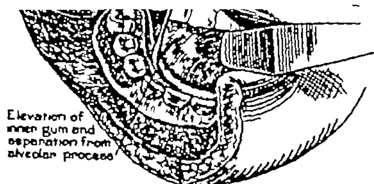
For more advanced lesions especially when teeth are present, a marginal resection of the alveolar process is required

283 In order to obtain adequate exposure the lower lip is split in the midline and a flap developed ›y extending the incision a short distance into the ›mental region

4 The first step m mobilization of the specimen ncision of the mucosa on the inner surface of the n and its separation from the mandible by blunt section.



283 The incision.



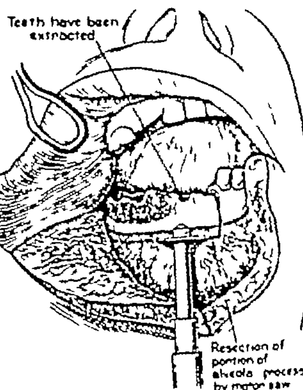
284 Mobilization of the specimen

MARGINAL RESECTION OF MANDIBLE (ALVEOLAR PROCESS) FOR CANCER OF THE GUM CONTINUED

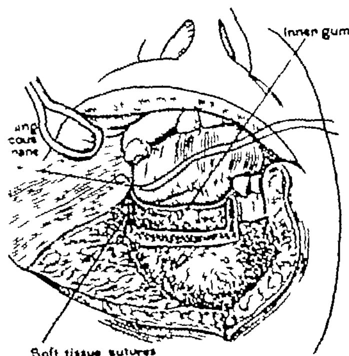
285 A vibratory bone saw is used to mobilize the bone for marginal resection

286 Following removal of the operative specimen, closure is begun by suture of the mucosa supported by layered soft tissue closure

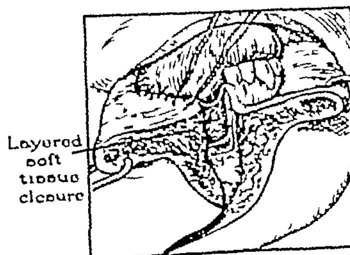
287 The layered closure is continued forward over the lip on to the skin No drains are used.

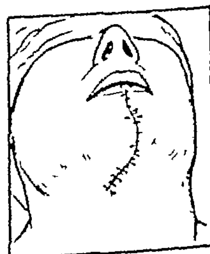


285 Mobilization of the bony alveolus.



286 Beginning closure of the wound.





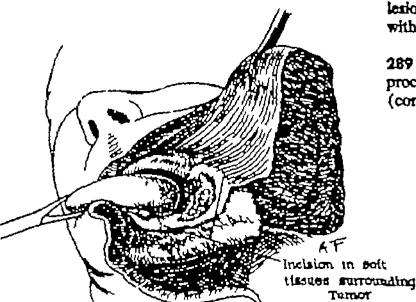
287 Closure of the wound

MARGINAL EXCISION OF THE LOWER ALVEOLUS AND A PORTION OF THE ASCENDING RAMUS FOR CANCER OF THE RETROMOLAR AREA (COMBINED WITH NECK DISSECTION)

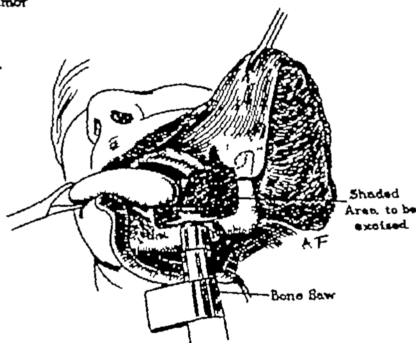
This operation is indicated particularly for moderately advanced tumors of the retromolar triangle and specifically includes a marginal resection of the ascending ramus Since exposure must be wide and the neck opened, a neck dissection should be done at the same time

288 After radical neck dissection has been performed, the lower lip is split in the midline and the cheek flap widely mobilized exposing the primary lesion which is circumscribed by a separate incision with a safe margin

289 The upper margin of the mandible (alveolar process) including an anterior margin of the ramus (coronoid process), is mobilized with a motor saw



288 Exposure of the primary lesion.

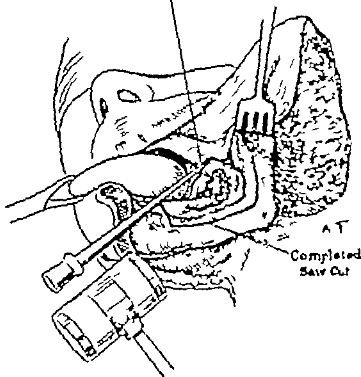


289 Mobilization of the surgical specimen including underlying bone.

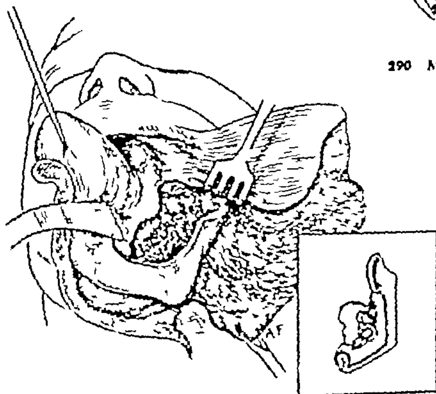
MARGINAL EXCISION OF THE LOWER ALVEOLUS AND A PORTION OF THE ASCENDING RAMUS FOR CANCER OF THE RETROMOLAR AREA (COMBINED WITH NECK DISSECTION) CONTINUED

290 The mobilization of the specimen is completed by prying it loose with a chisel and scalpel

291 The bone of the upper alveolus has been exposed The remaining margin of the ramus and the intact temporomandibular joint prevents undue deformity and disability



290 *Mobilization of the surgical specimen is begun.*

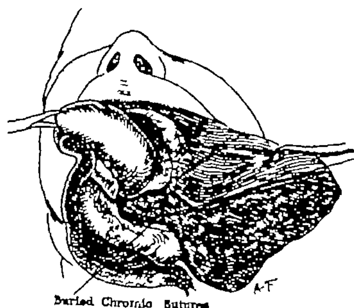


291 *Completed removal of the surgical specimen*

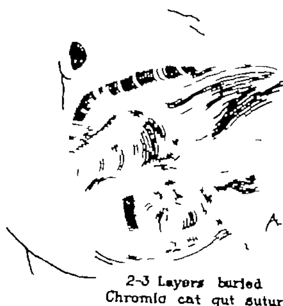
MARGINAL EXCISION OF THE LOWER ALVEOLUS AND A PORTION OF THE ASCENDING RAMUS FOR CANCER OF THE RETROMOLAR AREA (COMBINED WITH NECK DISSECTION) CONTINUED

292 293 Repair of the wound is effected by layered closure of the soft parts and accurate approximation of the mucous membrane edges.

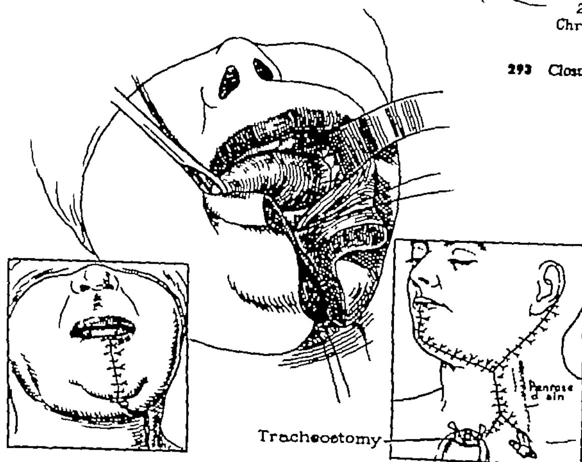
294 Since the bone has been widely excised it is prudent to make a prophylactic tracheostomy



292 Closure of the wound.



293 Closure of the wound.



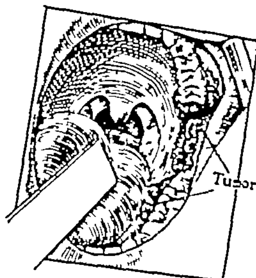
294 Closure completed.

OPERATIONS FOR CANCER OF THE GUM (Figs 295–299)

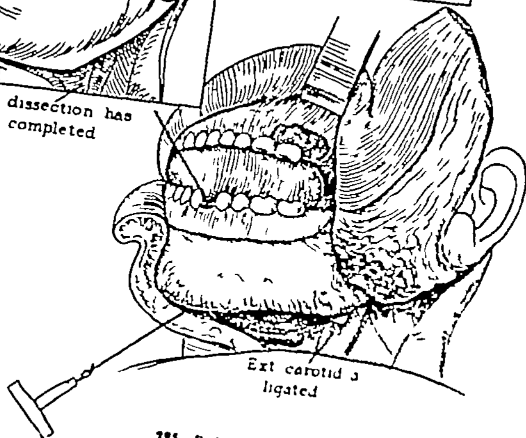
EXCISION OF CANCER INVOLVING BOTH UPPER AND LOWER GUMS AND RETROMOLAR AREA BY PARTIAL RESECTION OF THE MANDIBLE AND NECK DISSECTION

This combined operation is indicated for tumors variously placed including those which involve soft parts adjacent to the retromolar triangle (floor of mouth tongue upper gum cheek anterior tonsil pillar) Such extensive growths are usually associated both with deep invasion of bone and with involvement of the upper gum and palate Such extension and invasion does not necessarily preclude successful primary closure

295 After a neck dissection and splitting the lower lip and laying back the left cheek flap the mandible is sectioned somewhere in the neighborhood of the bicuspid teeth depending upon the anterior extent of the tumor



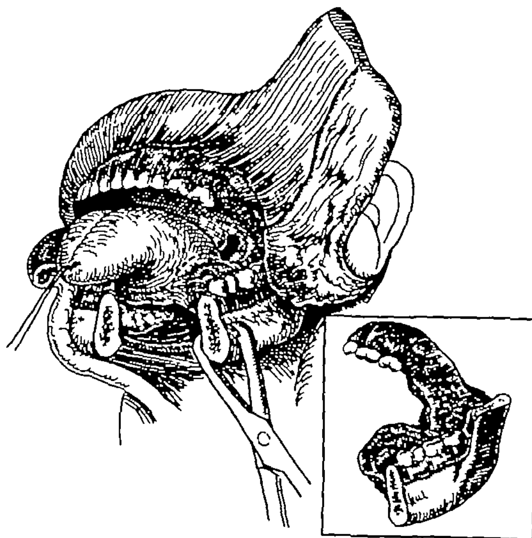




295 Preliminary exposure

EXCISION OF CANCER INVOLVING BOTH UPPER AND LOWER GUMS AND RETROMOLAR AREA BY PARTIAL RESECTION OF THE MANDIBLE AND NECK DISSECTION CONTINUED

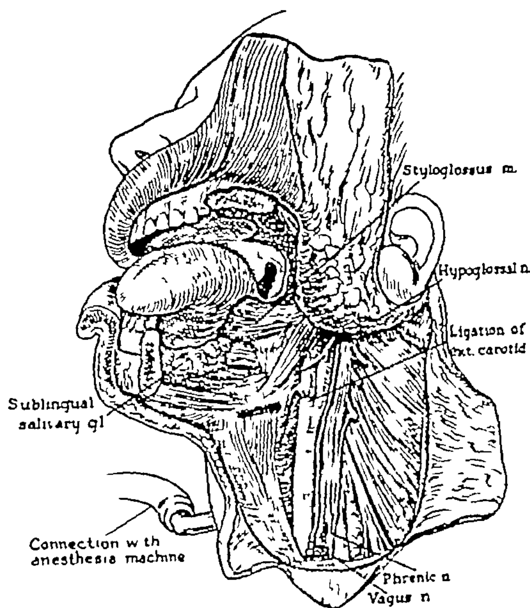
296 The lines of incision in the soft tissues depend upon the position and extent of the tumor The tonsil and part of the soft palate may be removed if necessary A vibratory bone saw should be used to mobilize a portion of the upper alveolus



296 Mobilization of the specimen.

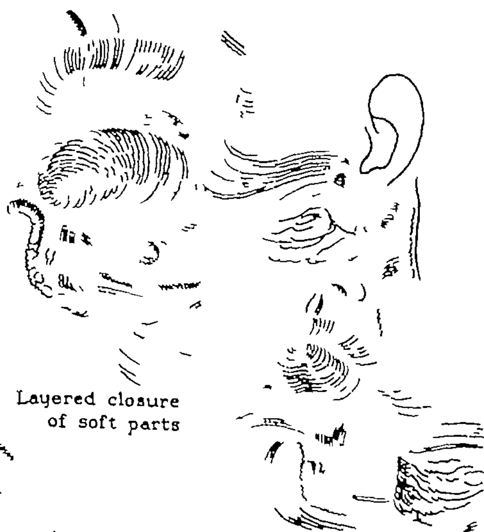
EXCISION OF CANCER INVOLVING BOTH UPPER AND LOWER GUMS AND RETROMOLAR AREA BY PARTIAL RESECTION OF THE MANDIBLE AND NECK DISSECTION CONTINUED

297 298 299 In some cases of wide defects the mucosal closure cannot be made in a straight line but must be branched Care should be taken to support all lines of mucosal suture with buried sutures to approximate the soft parts A prophylactic tracheostomy has been made

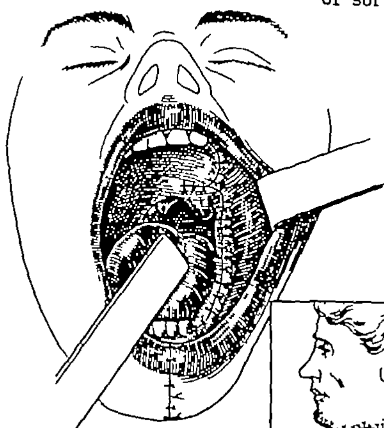


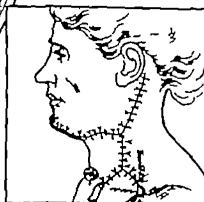
297 Extent of the tissue defect.

EXCISION OF CANCER INVOLVING BOTH UPPER AND LOWER GUMS AND RETROMOLAR AREA BY PARTIAL RESECTION OF THE MANDIBLE AND NECK DISSECTION CONTINUED



298 Closure of the wound.



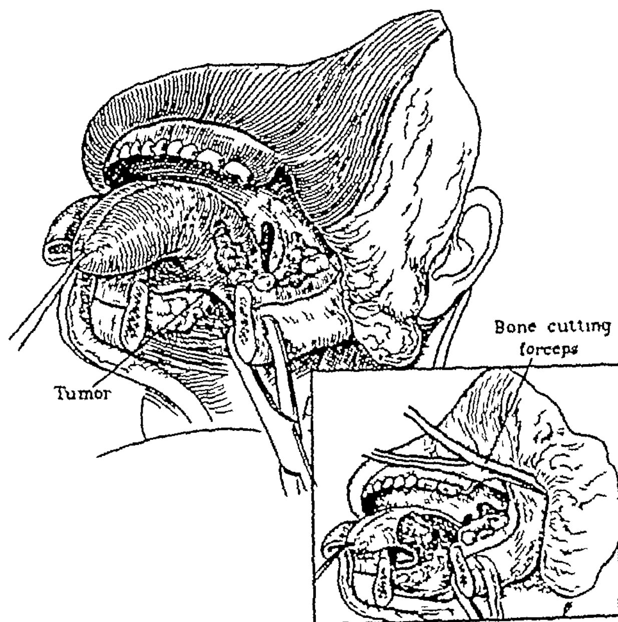


299 The completed closure.

EXCISION OF CANCER INVOLVING BOTH UPPER AND LOWER GUMS AND RETROMOLAR AREA BY PARTIAL RESECTION OF THE MANDIBLE AND NECK DISSECTION CONTINUED

Variation in Procedure When Cancer of the Gum Involves the Edge of the Tongue

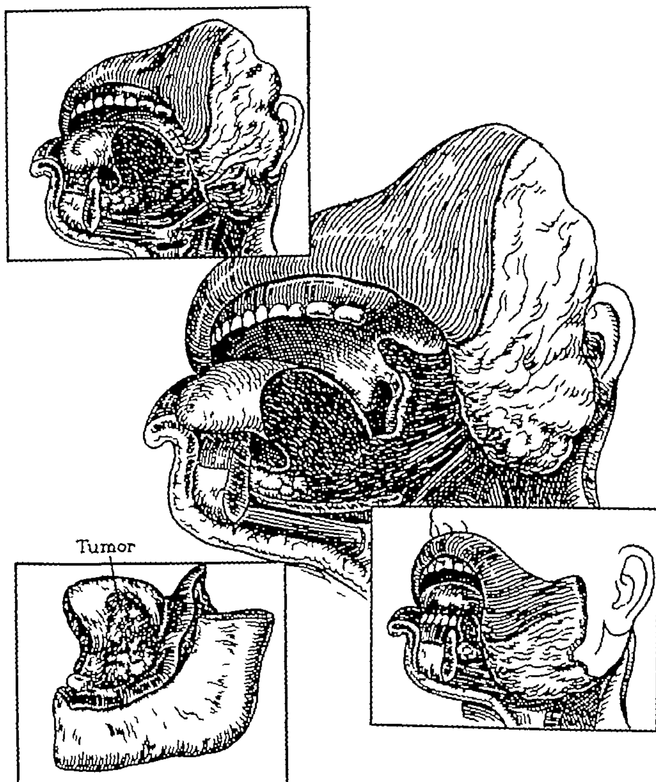
300 If the lesion involves the lateral edge of the tongue and the soft palate portions of these structures should be resected



300 Variation in procedure when cancer extends to tongue

EXCISION OF CANCER INVOLVING BOTH UPPER AND LOWER GUMS AND RETROMOLAR AREA BY PARTIAL RESECTION OF THE MANDIBLE AND NECK DISSECTION CONTINUED

301 The necessity for approximation by layered closure of the soft part is again illustrated



301 The extent of the excision and beginning closure.

Chapter 13

OPERATIONS ON THE MANDIBLE

OPERATIONS ON THE MANDIBLE FOR PRIMARY TUMORS OF BONE, FOR TEMPORARY SECTION OF THE MANDIBLE; HEMIMANDIBULECTOMY (Figs 302–308)

HEMIMANDIBULECTOMY

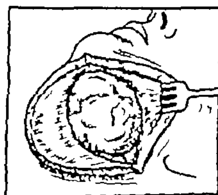
There are comparatively few indications for resection of a part or the whole of the mandible (without inclusion of adjacent soft tissues) except for such primary lesions as adamantinoma and for primary and/or cystic lesions of the bone It is sometimes useful to section the mandible temporarily for access to the pterygo-maxillary space

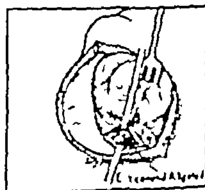
302 A curved incision is made in the submaxillary region and carried down to the outer surface of the tumor or the mandible So as to reduce the degree of hemorrhage exposure and ligation of the external carotid artery is optional

303 The mandible is sectioned at the site of election

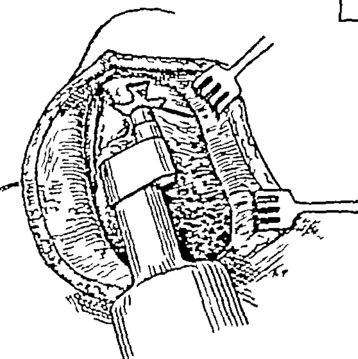
Although not shown in these drawings replacement by a wire mesh splint or bone graft finds its greatest application in these cases of benign or relatively benign growths of bone (Figs 320–346)







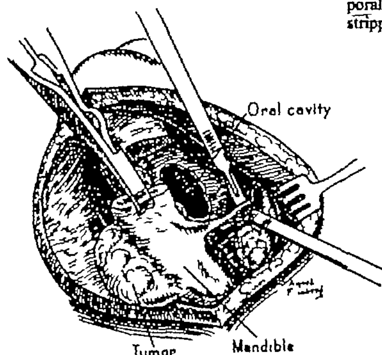
302 Preliminary ligation of external carotid



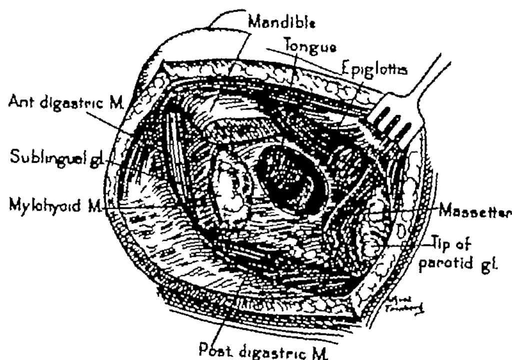
303 Section of the mandible

HEMIMANDIBULECTOMY CONTINUED

304 305 If teeth are present the oral cavity must necessarily be entered. The ramus is mobilized by severing the attachments of the pterygoid and temporal muscles The masseter muscle is sectioned and stripped off the external surface



304 Mobilization of the surgical specimen.

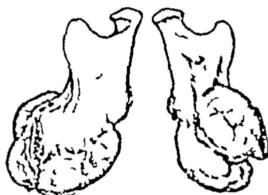


305 Operative wound following removal of the specimen.

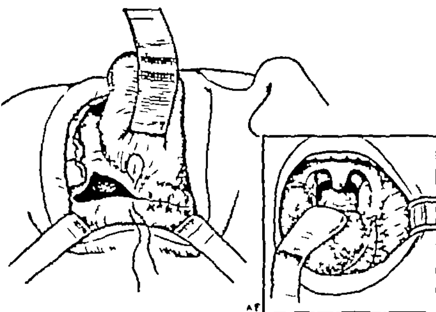
HEMIMANDIBULECTOMY CONTINUED

307 The opening in the oral mucosa is closed with nonabsorbable sutures tied inside the mouth

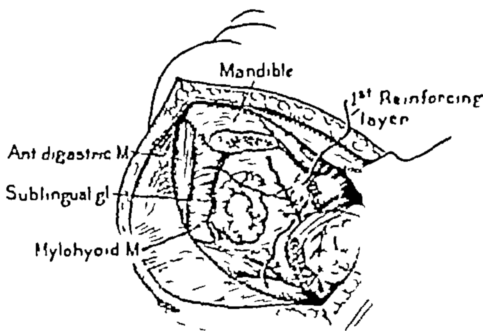
308 At least one layer of supporting buried sutures of chromic catgut are placed within the wound itself before closure of the skin and subcutaneous tissues.



306 The surgical specimen.



307 Closure of the intraoral wound.

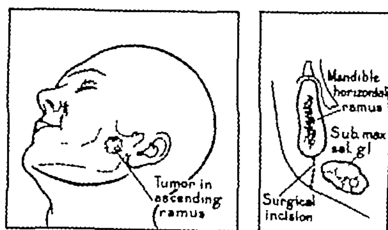


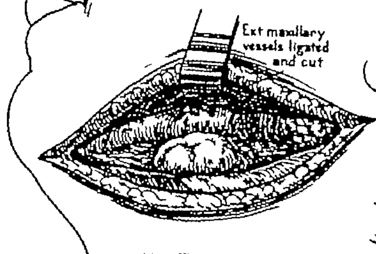
308 Closure of

RESECTION OF RAMUS FOR PRIMARY BONE TUMOR

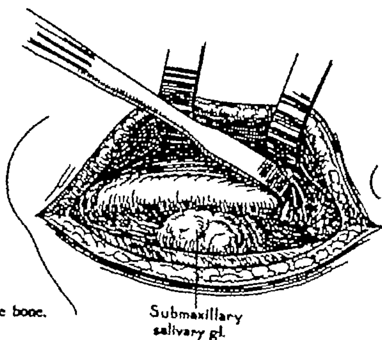
309 A curved incision is made in the · space sufficiently low to avoid injury to the bularis branch of the 7th nerve The external illary vessels are ligated and cut.

310 The incision is carried directly down to lower edge of the mandible the periosteum muscular attachments are stripped upward to the ramus





309 The incision.

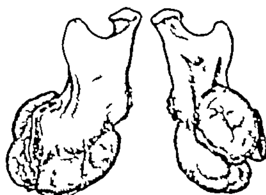


310 Exposure of the bone.

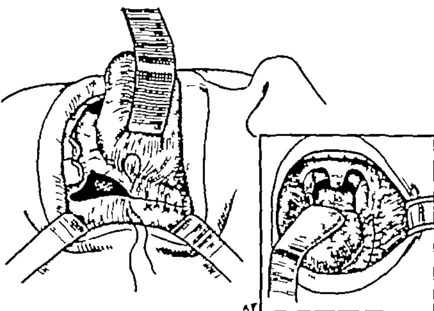
HEMIMANDIBULECTOMY CONTINUED

307 The opening in the oral mucosa is closed with nonabsorbable sutures tied inside the mouth

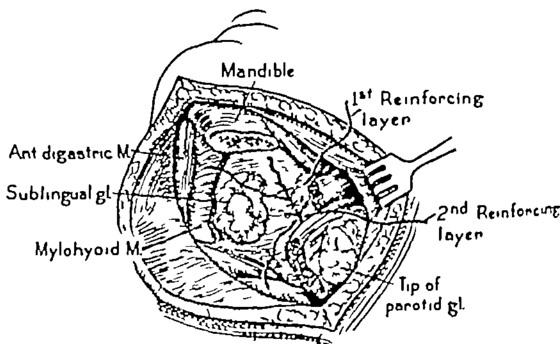
308 At least one layer of supporting buried sutures of chromic catgut are placed within the wound itself before closure of the skin and subcutaneous tissues



306 The surgical specimen



307 Closure of the intraoral wound.



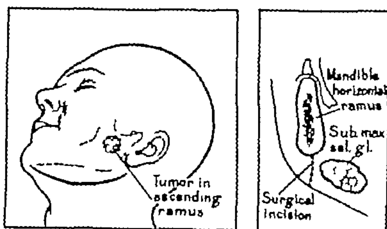
308 Closure of the external wound.

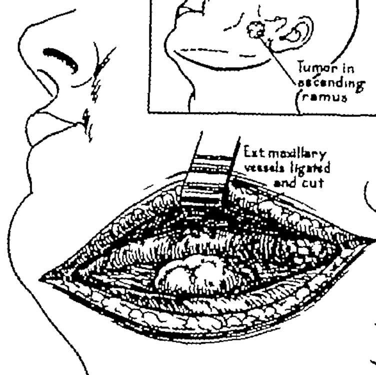
OPERATIONS ON THE MANDIBLE (Figs. 309–312)

RESECTION OF RAMUS FOR PRIMARY BONE TUMOR

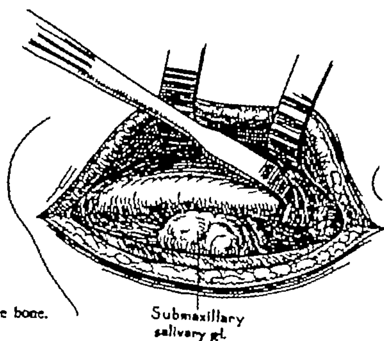
309 A curved incision is made in the space sufficiently low to avoid injury to the bularis branch of the 7th nerve The external illary vessels are ligated and cut.

310 The incision is carried directly down to lower edge of the mandible the periosteum muscular attachments are stripped upward to the ramus





309 The incision.

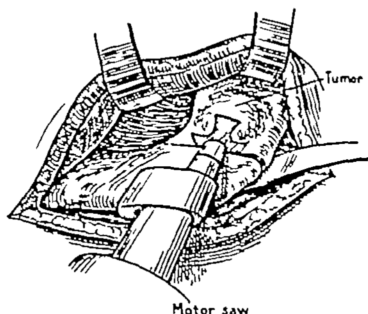


310 Exposure of the bone.

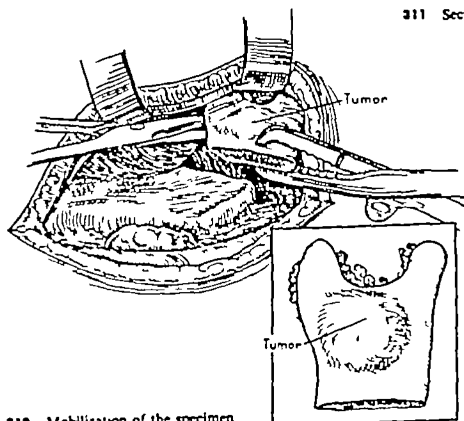
RESECTION OF RAMUS FOR PRIMARY BONE TUMOR CONTINUED

311 With the vibratory saw (or Gigli) the ramus is sectioned distal to the tumor

312 With the bone holding forceps the ramus is mobilized by freeing the attachments of the pterygoid and temporal muscles



311 Section of the bone



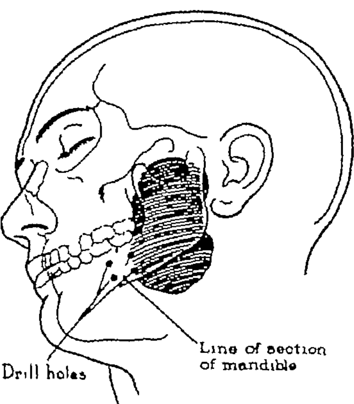
312 Mobilization of the specimen

TEMPORARY SECTION OF THE MANDIBLE FOR APPROACH TO THE PTERYGOMAXILLARY SP

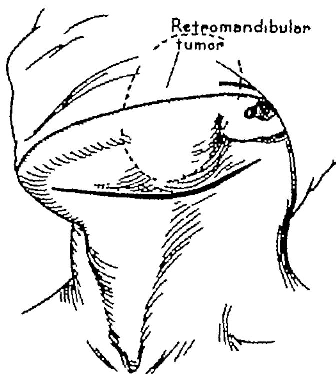
In rare instances soft tissue tumors (usually benign) arise in the pterygomaxillary space, and surgical access is difficult because of the overlying ramus of the mandible In such cases temporary section of the mandible, with resuturing on completion of the operation is a useful expedient.

313 The line of section of the mandible ... be selected with some regard to the presence of ... if any and should be placed so as to avoid injury or loss, if possible.

314 A curved incision is made in the ... space, centered just below the angle of the ...



313 The line of section of mandible.

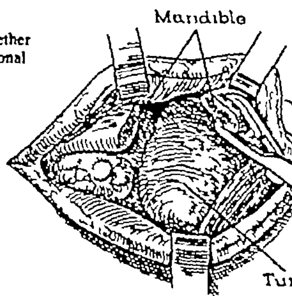


314 The incision.

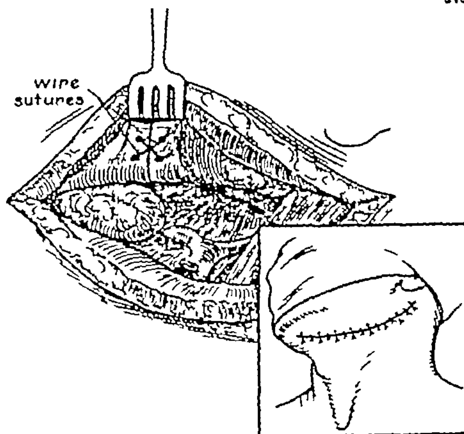
TEMPORARY SECTION OF THE MANDIBLE FOR APPROACH TO THE PTERYGOMAXILLARY SPACE
CONTINUED

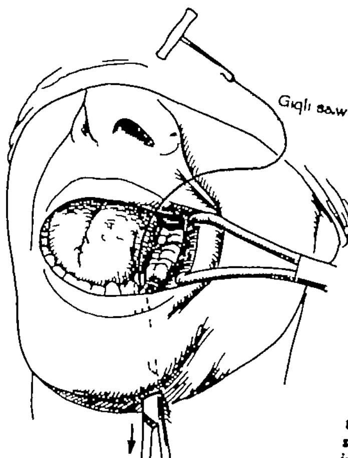
315 Holes have been drilled before the mandible is sectioned The mandible is temporarily sectioned and the posterior fragment elevated to expose the pterygomaxillary space The tumor is removed by blunt dissection and enucleation

316 The mandibular fragments are wired together just before closure of the wound Drainage is optional



315 Exposure of the tumor





317 Placement of the Gigli saw

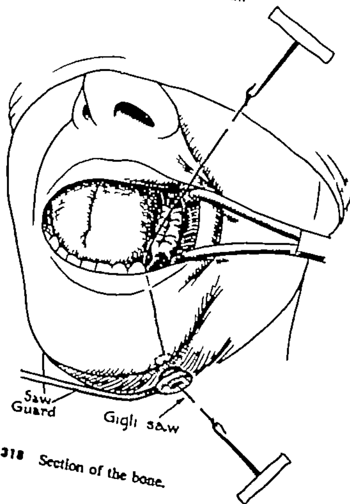
RESECTION OF THE MANDIBLE THROUGH THE OPEN MOUTH

Conservative resection of the mandible is seldom applicable except for radionecrosis of the mandible

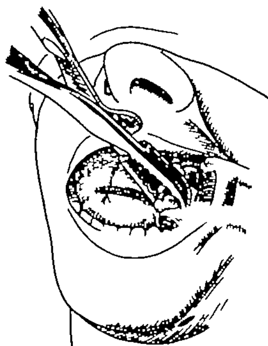
317 Teeth may have to be extracted at the line excision. A stab wound is made in the submaxill area near the lower edge of the mandible opposite level of the intended section of bone A Kelly forceps is pushed upward into the floor of mouth to grasp the Gigli saw and pull it

318 A Gigli saw guard is threaded over the C saw so as to avoid laceration of the skin. The dible is sectioned

319 An incision is made in the mucosa of gingivobuccal gutter and in the inner surface of gum. The posterior bone fragment is grasped the bone-holding forceps and with periosteal elev scissors and scalpel the bone is mobilized by ing the muscular and tendon attachments When temporomandibular joint is reached the bone men is avulsed and the wound packed



318 Section of the bone.

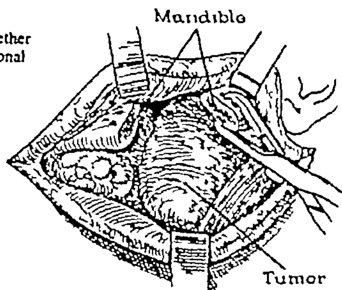


319 Removal of

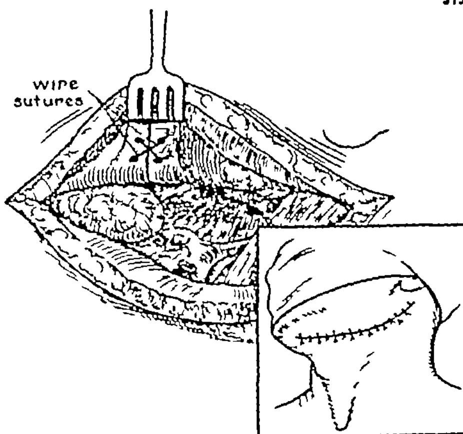
TEMPORARY SECTION OF THE MANDIBLE FOR APPROACH TO THE PTERYGOMAXILLARY SPACE
CONTINUED

315 Holes have been drilled before the mandible is sectioned The mandible is temporarily sectioned and the posterior fragment elevated to expose the pterygomaxillary space The tumor is removed by blunt dissection and enucleation

316 The mandibular fragments are wired together just before closure of the wound Drainage is optional

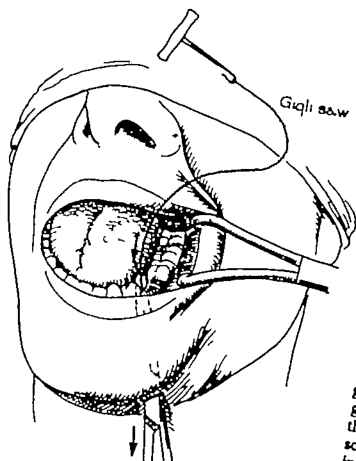


315 Exposure of the tumor



316 Resuture of the mandibular fragments

OPERATIONS ON THE MANDIBLE (Figs 317–319)



317 Placement of the Gigli saw

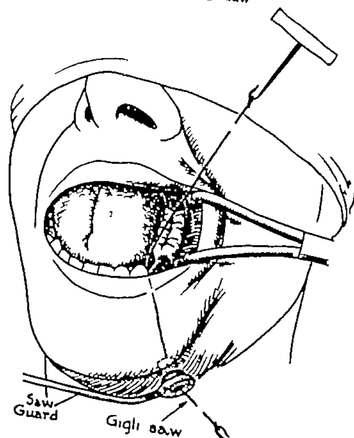
RESECTION OF THE MANDIBLE THROUGH THE OPEN MOUTH

Conservative resection of the mandible is seldom applicable, except for radionecrosis of the mandible

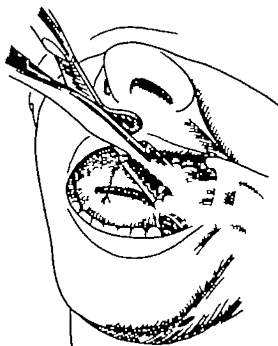
317 Teeth may have to be extracted at the line excision. A stab wound is made in the area near the lower edge of the mandible opposite level of the intended section of bone A cu Kelly forceps is pushed upward into the floor of mouth to grasp the Gigli saw and pull it through

318 A Gigli saw guard is threaded over the Gi saw so as to avoid laceration of the skin. The dible is sectioned

319 An incision is made in the mucosa of gingivobuccal gutter and in the inner surface of the gum The posterior bone fragment is grasped wit the bone-holding forceps and with periosteal elev scissors and scalpel the bone is mobilized by sev ing the muscular and tendon attachments When temporomandibular joint is reached the bone men is avulsed and the wound packed.



318 Section of the bone.

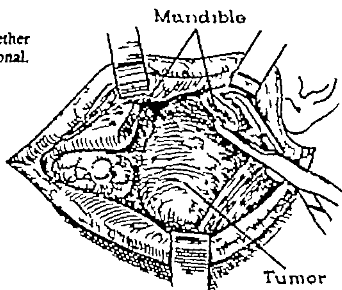


319 Removal of the

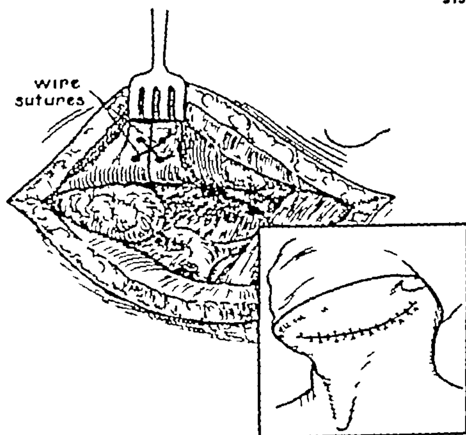
TEMPORARY SECTION OF THE MANDIBLE FOR APPROACH TO THE PTERYGOMAXILLARY SPACE
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RESECTION OF THE MANDIBLE THROUGH THE OPEN MOUTH

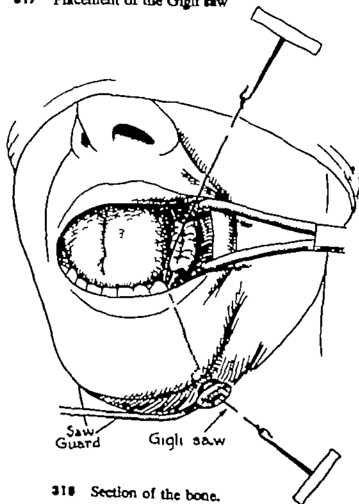
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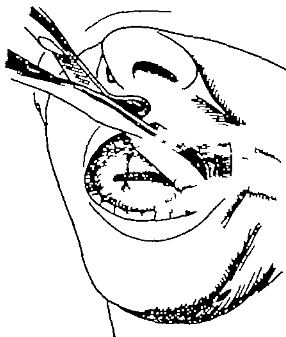
318 A Gigli saw guard is threaded over the C saw so as to avoid laceration of the skin. The ma dible is sectioned.

319 An incision is made in the mucosa of gingivobuccal gutter and in the inner surface of gum The posterior bone fragment is grasped the bone holding forceps, and with periosteal scissors and scalpel the bone is mobilized by se ing the muscular and tendon attachments When temporomandibular joint is reached, the bone men is avulsed and the wound packed.

317 Placement of the Gigli saw



318 Section of the bone.



319 Removal of the

Chapter 14

BURIED METAL SPLINTS AND BONE GRAFTS FOR MANDIBULAR DEFECTS

BURIED METAL SPLINTS AND BONE GRAFTS FOR MANDIBULAR DEFECTS

In recent years buried metal splints for mandibular defects have proved to have a number of advantages over bone grafts Both procedures are described in the succeeding pages

When only the posterior portion of one mandible is resected, at about the level of the first molar there is little benefit to be obtained from any form of graft or splint When the line of excision is at the bicuspid area, some consideration may be given to the use of a splint or graft. When there has been an associated excision of a wide area of adjacent tongue, the closure may require a shift of the lateral wall of the oropharynx mesially for a distance of several centimeters. In these cases, the presence of any form of splint or graft would nullify one of the advantages of bone resection

Chapter 14

BURIED METAL SPLINTS AND BONE GRAFTS FOR MANDIBULAR DEFECTS

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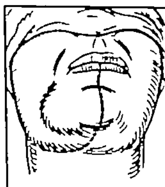
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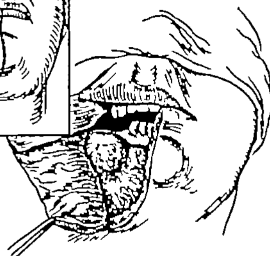
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PARTIAL RESECTION OF MANDIBLE AND REPAIR BY WIRE MESH SPLINT

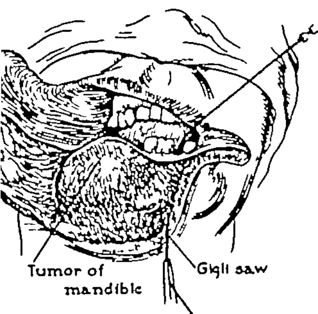
320 The chin is split in the midline and the cheek flap laid back

321 322 A hemostat is pushed upward into the floor of the mouth the Gigli saw pulled through, and the mandible sectioned

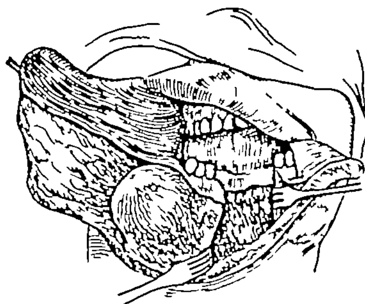




320 The incision and superficial flap



321 Placement of Gigli saw



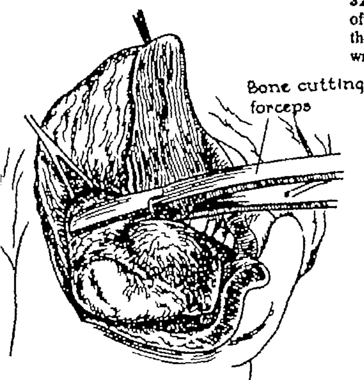
322 Completed section of mandible

PARTIAL RESECTION OF MANDIBLE AND REPAIR BY WIRE MESH SPLINT CONTINUED

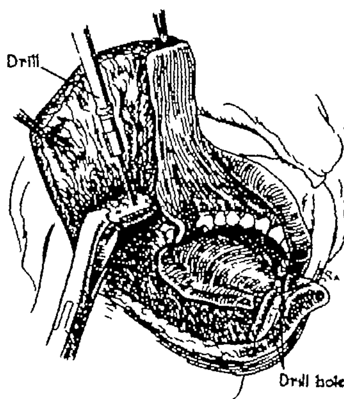
323 The ramus is most expeditiously severed by bone-cutting forceps care being taken to avoid splintering.

324 Holes are drilled through the ends of the sectioned bone. With a vibratory saw a kerf about 7 to 8 mms deep is made in the end of the anterior fragment

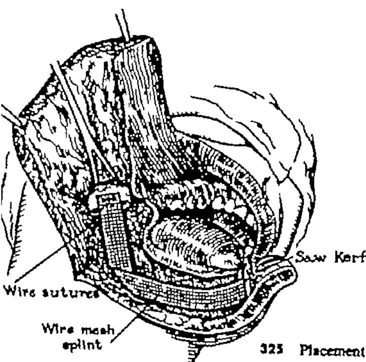
325 Wire sutures are used to stabilize an overlay of the wire mesh to the ramus The anterior end of the splint is placed in the saw kerf and secured by a wire suture through the drill holes.



323 Section of ramus



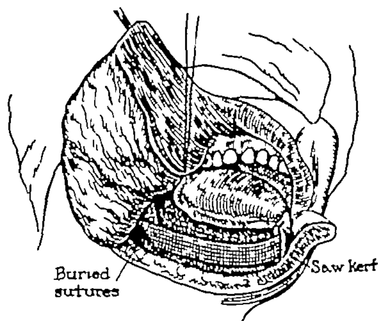
324 Preparation of the ends of sectioned bone tach splint.



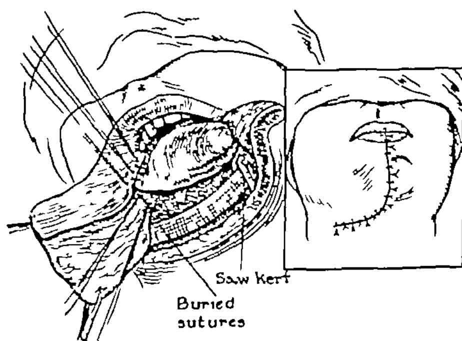
325 Placement of the wire mesh splint.

PARTIAL RESECTION OF MANDIBLE AND REPAIR BY WIRE MESH SPLINT CONTINUED

326 327 The mucosa is meticulously closed by alternate mattress and regular sutures. At least one but preferably two layers of buried sutures are placed so that the splint has adequate soft tissue coverage



326 Closure of the wound

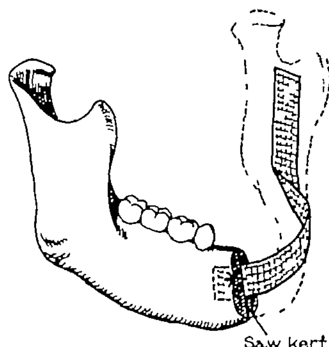


327 Closure of the wound

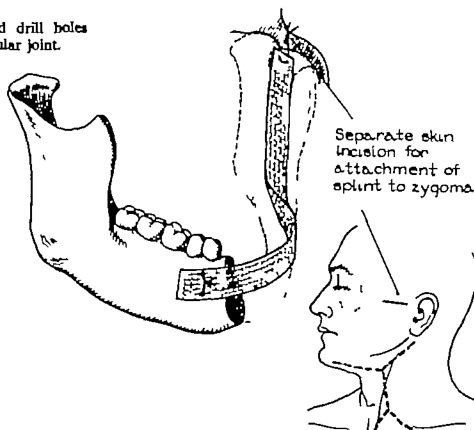
PARTIAL RESECTION OF MANDIBLE AND REPAIR BY WIRE MESH SPLINT VARIATION IN METHOD OF ATTACHING WIRE MESH SPLINT

328 When over half of the mandible has been removed and disarticulated at the temporomandibular joint, the distal end of the wire mesh splint may be placed without attachment in the position near the temporomandibular joint and its anterior end fixed in a saw kerf with a wire suture

329 The wire mesh replacement for the ramus may be attached to the zygoma, the fixation here being made through a separate incision The splint may be fixed to a fragment of the mandible by an overlay and wire suture through drill holes but placement within a saw kerf tends to be more stable



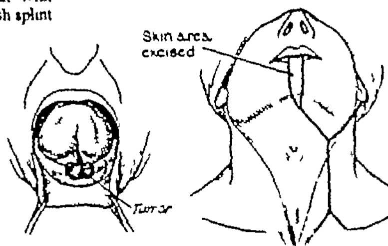
328 Attachment by saw kerf and drill holes loose attachment at temporomandibular joint.



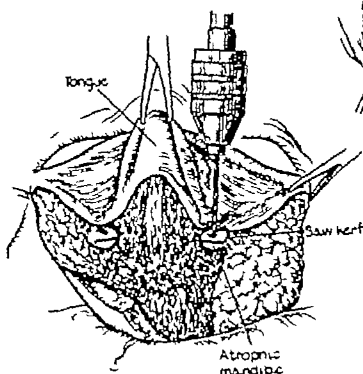
329 Attachment by overlay and drill holes, attachment to zygoma

RESECTION OF THE MANDIBLE AND REPAIR BY WIRE MESH SPLINT: VARIATION IN POSITION—ANTERIOR PORTION OF MANDIBLE

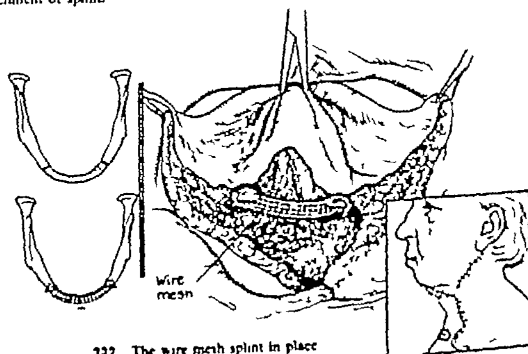
330 331 332 The direction of the saw kerfs is usually perpendicular but when there is great atrophy of the rami the direction may best be horizontal. With horizontal saw kerfs the ends of the wire mesh splint must be given a quarter turn.



330 The incision.



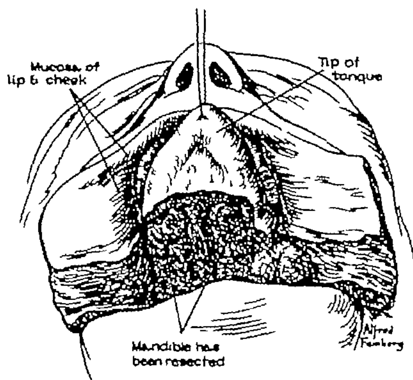
Preparation of bone for attachment of splint.



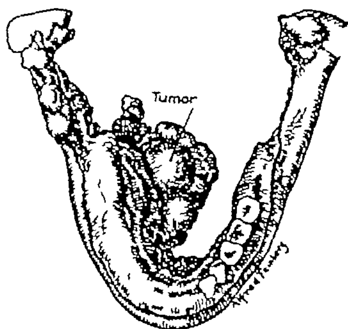
332 The wire mesh splint in place

TOTAL RESECTION OF MANDIBLE WITH REPLACEMENT BY WIRE MESH SPLINT

333 334 Through an inverse T-incision (splitting the lower lip in the midline) the entire mandible has been resected.



333 The wound following resection of the mandible.



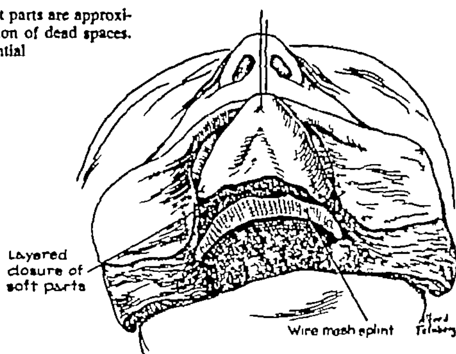
334 The surgical specimen

TOTAL RESECTION OF MANDIBLE WITH REPLACEMENT BY WIRE MESH SPLINT CONTINUED

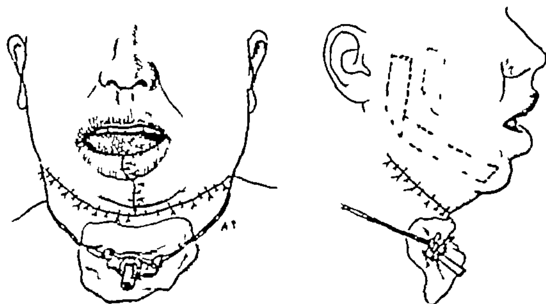
335 After partial closure of the mucous membrane and layered closure of the soft parts, a wire mesh splint is placed in the defect with the free ends in the position of the temporomandibular joints

By the use of the layered apposition of the soft parts, the splint is buried in the soft tissue eliminating all dead space possible.

336 The skin and superficial soft parts are approximated, with attention to elimination of dead spaces. Prophylactic tracheostomy is essential



335 Placement of the wire mesh splint and beginning of mucosal closure.



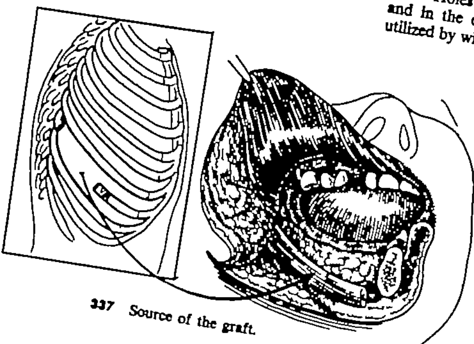
336 Completed closure of the wound and prophylactic tracheostomy

BONE GRAFTS FOR MANDIBULAR DEFECTS (Figs. 337–339)

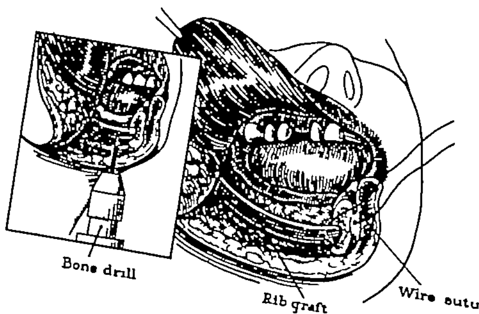
RIB GRAFTS FOR MANDIBULAR DEFECTS

337 A rib graft of sufficient length is taken fro a section of the 8th or 9th rib The external perio teum should be left attached. One end of the gra is placed in the region of the temporomandibula joint.

338 Holes are drilled in the distal end of the graft and in the end of the mandible and the fragment utilized by wire ligatures.



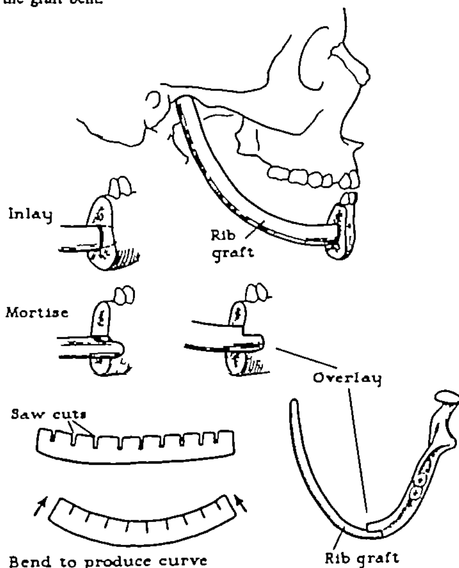
337 Source of the graft.



338 Fixation of the graft.

RIB GRAFTS FOR MANDIBULAR DEFECTS
CONTINUED

339 The rib graft may be attached to the mandibular fragment by several alternate methods (inlay mortise or overlay) If additional curvature is desired in the rib graft partial saw cuts may be made along one border and the graft bent.

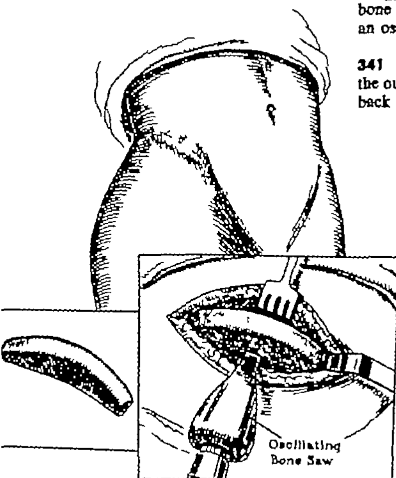


339 Variations in shaping and fixation of graft

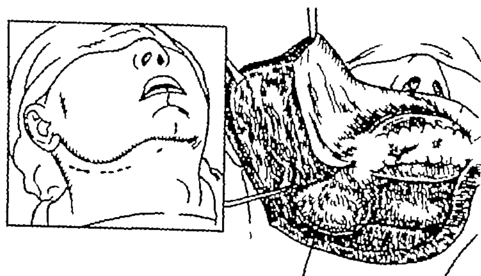
ILIAC CREST GRAFTS FOR MANDIBULAR ...

340 The bone of the iliac crest is exposed by oblique incision leaving the periosteum attached. A bone graft of the desired dimensions is mobilized by an oscillating bone saw

341 In a representative case of benign bone ..., the outer surface of the mandible is exposed by lay... back a cheek flap



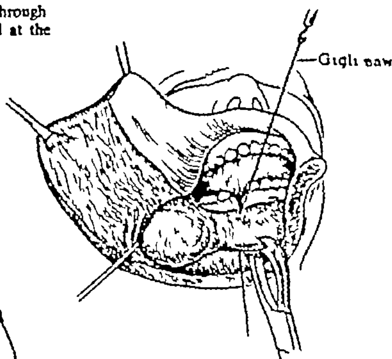
340 Taking the bone graft.



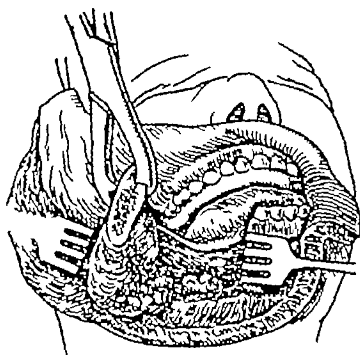
341 Exposure of the tumor

ILIAC CREST GRAFTS FOR MANDIBULAR DEFECTS
CONTINUED

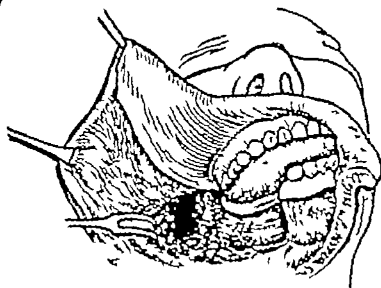
342 343 344 A blunt artery forceps is pushed along through the inner surface of the mandible into the floor of the mouth and a Gigli saw pulled through The mandible is sectioned and disarticulated at the temporomandibular joint.



342 Section of the mandible



343 Mobilization of the operative specimen

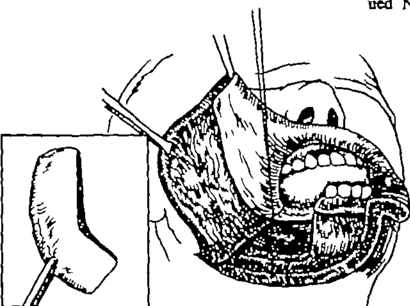


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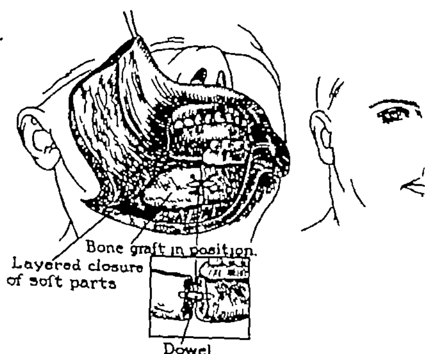
ILIAC CREST GRAFTS FOR MANDIBULAR DEFECTS CONTINUED

345 After partial closure of the wound in the mouth by both mucosal and submucosal sutures a trimmed and shaped bone graft from the iliac crest is placed within the defect.

346 The upper end of the graft is placed at the site of the temporomandibular joint without any other fixation. The lower end of the graft is attached to the mandibular fragment by crossed ties of #2–0 braided stainless steel wire The addition of a dowel of a bone fragment is useful to stabilize this attachment. The layered closure of the soft parts is continued No drain is used.



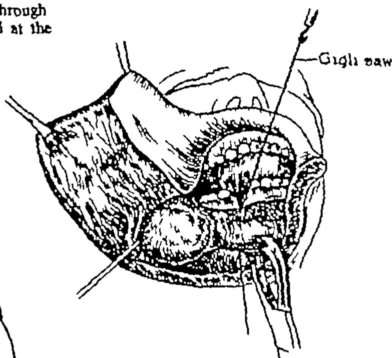
345 Placement of the bone graft.



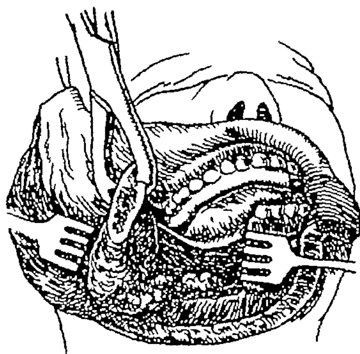
346 Fixation of the bone graft.

ILIAC CREST GRAFTS FOR MANDIBULAR DEFECTS
CONTINUED

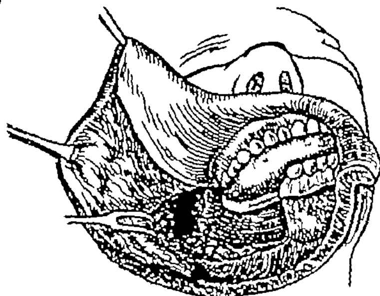
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342 Section of the mandible.



343 Mobilization of the operative specimen

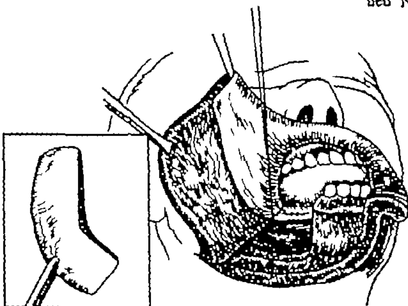


344 The resection completed

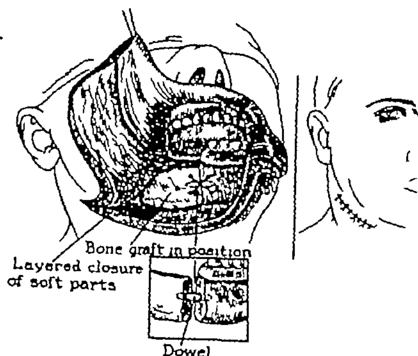
ILIAC CREST GRAFTS FOR MANDIBULAR DEFECTS CONTINUED

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346 The upper end of the graft is placed at the site of the temporomandibular joint without other fixation. The lower end of the graft is attached to the mandibular fragment by crossed ties of #2 braided stainless steel wire. The addition of a dowel of a bone fragment is useful to stabilize this ment. The layered closure of the soft parts is ued No drain is used.



345 Placement of the bone graft.



346 Fixation of the bone graft.

Chapter 15

OPERATIONS ON THE TONGUE

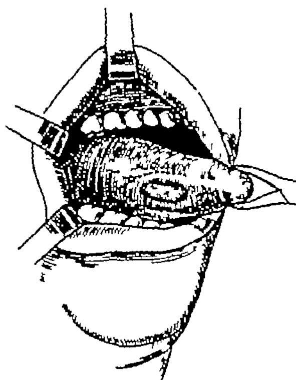
LOCAL EXCISION OF LESIONS ON THE LATERAL BORDER

The term "local excision" is here used to distinguish the less extensive operations from the more extensive partial glossectomy subtotal, or total glossectomy

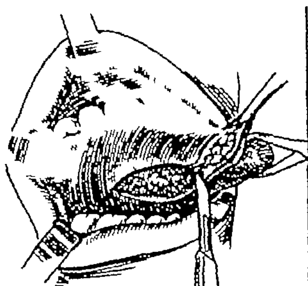
Local excision is suitable in smaller growths of the tongue, even though they are malignant, but this conservative operation is attended by a greater danger of local recurrence than is the more extensive partial glossectomy

347 The tongue is grasped with a tenaculum (Adair forceps) and partly withdrawn from the mouth An elliptical incision of adequate width from the borders of the lesion is planned

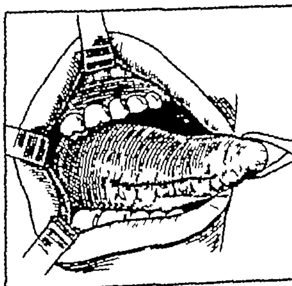
348 349 After the specimen has been excised the wound is closed by regular mattress and superficial sutures.



347 Location of the incision.



348 Excision of the lesion.

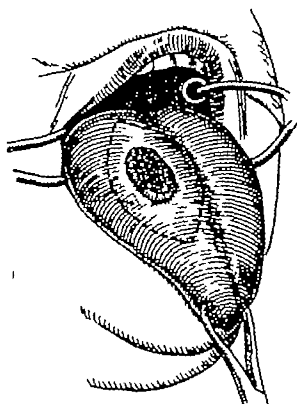


349 Closure of the wound.

LOCAL EXCISION OF LESIONS ON THE DORSUM

350 The incision can be either longitudinal o transverse, depending upon the configuration of th tumor

351 The incision is carried deeply into the muscl and before the specimen is completely excised sutur is begun posteriorly and continued as the tumor i progressively mobilized



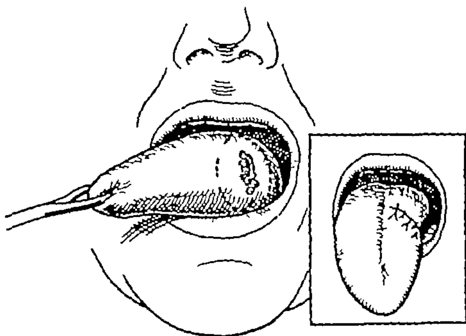
350 The line of incision.



351 Excision of the specimen and closure of the wound

LOCAL EXCISION OF LESIONS THROUGH VERTICAL ELLIPSE

352 If the configuration of the lesion requires it, the ellipse should be vertical instead of horizontal



352 The line of incision for lesions with a long vertical diameter

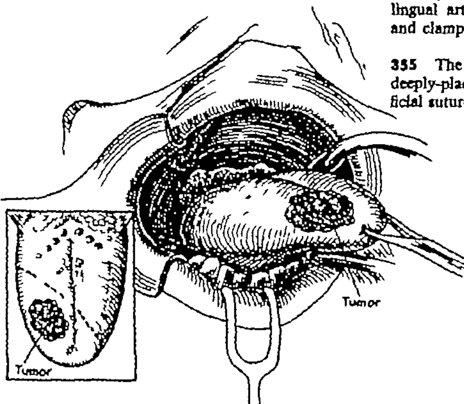
FOR GROWTHS AT THE TIP, LATERAL BORDER OR DORSUM OF THE TONGUE

The term "partial glossectomy" should be used to define operations which include the removal of a considerable portion of the muscular body of the tongue. The procedure is indicated for conditions too extensive for local excision

353 If the lesion is to one side of the midline th line of incision should be on the bias.

354 The incision should be made by scalpel rathe than by endothermy or cautery The larger vessel lingual arteries and veins usually can be identifie and clamped before section

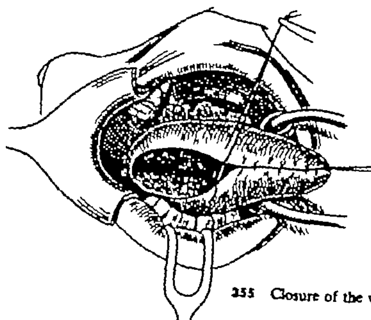
355 The incision should be closed by one layered deeply-placed, alternating vertical mattress and super ficial sutures of nylon.



353 Location of the incision.



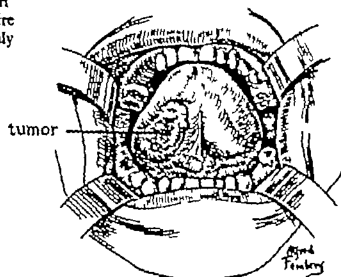
354 Excision of the gr



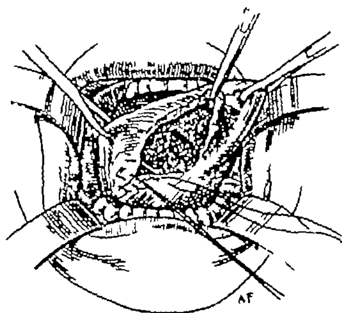
355 Closure of the wound.

FOR LESIONS ON THE UNDERSURFACE NEAR THE TIP OF THE TONGUE

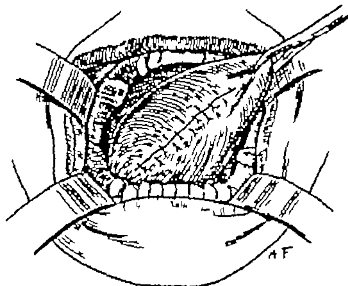
356 357 358 The tongue is grasped with tenaculum (Adair) forceps and withdrawn from the mouth. The incision is in the form of an ellipse starting posteriorly. Suturing begins before the entire specimen is removed. Hemostasis is achieved mainly by deep mattress sutures.



356 A growth on the undersurface near the tip of the tongue.



357 Excision of the lesion

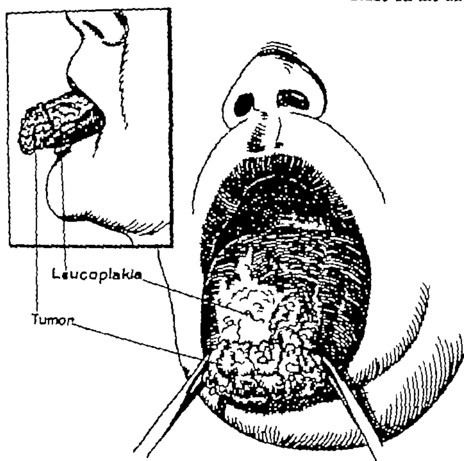


358 Closure of the wound

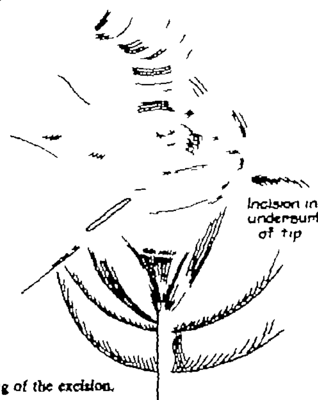
FOR SUPERFICIAL LESIONS INVOLVING THE TIP AND MOST OF THE DORSUM OF THE TONGUE

In this procedure it is to be noted that the uninvolved mucosa on the undersurface and the tip of the tongue is preserved and folded over to help close the defect of the upper surface

359 360 The lesion consisting mainly of papillary leukoplakia or low-grade cancer involves the entire dorsum of the tongue The first incision is made on the undersurface of the tip



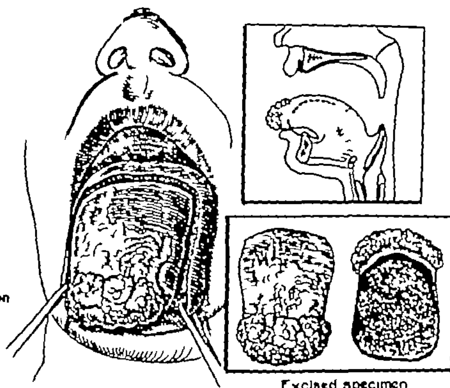
359 The character of the lesion.



360 Beginning of the excision.

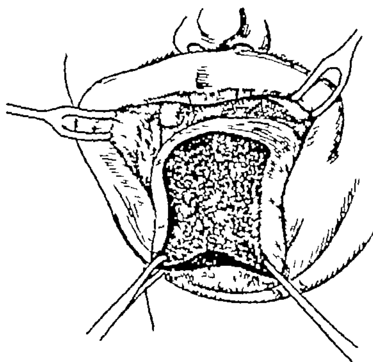
FOR SUPERFICIAL LESIONS INVOLVING THE TIP AND MOST OF THE DORSUM OF THE TONGUE
CONTINUED

361 362 The tip and almost the entire mucosa of the dorsum of the tongue are excised with a fairly thick layer of underlying muscle especially at the tip



361 Continuation of the excision

Excised specimen

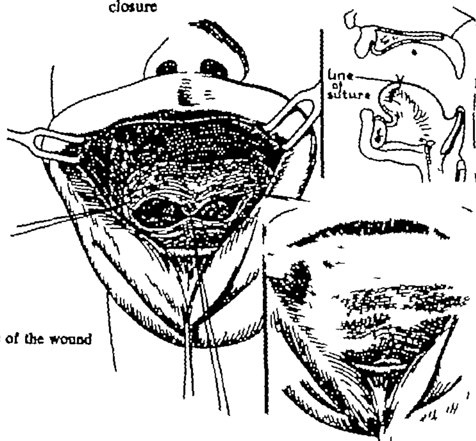


362 Appearance of the wound following the excision.

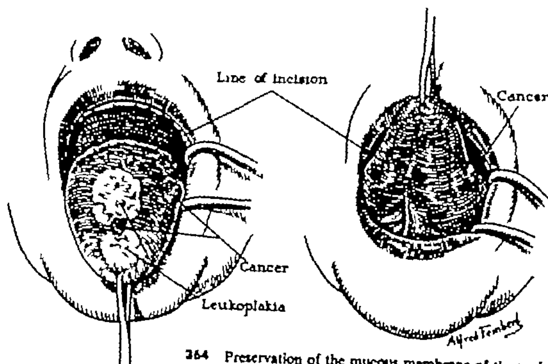
FOR SUPERFICIAL LESIONS INVOLVING THE TIP AND MOST OF THE DORSUM OF THE TONGUE
CONTINUED

363 The undersurface of the tip is folded up and over to cover the raw surface The tongue is i , shortened but remains functionally useful

364 The preceding technic can be used to the border of the tongue as well as the dorsum using the undersurface of the tip of the tongue to assist closure



363 Closure of the wound



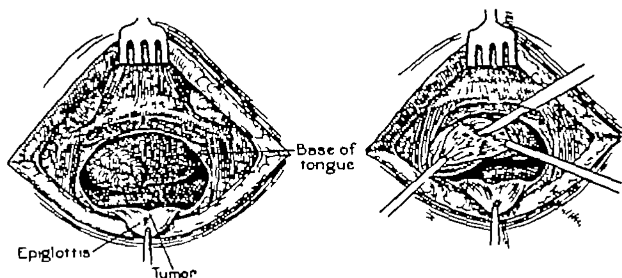
364 Preservation of the mucous membrane of the undersurface of the tip of the for closure of defects of the dorsum.

FOR THE BASE OF THE TONGUE VIA ANTERIOR PHARYNGOTOMY

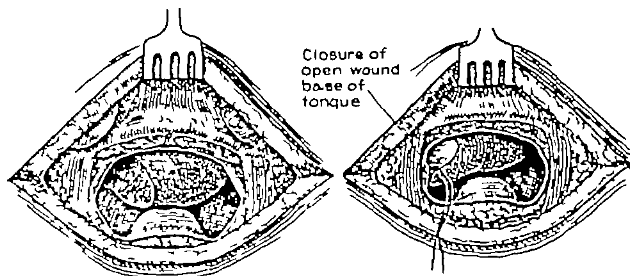
365 For the details of the previous steps for exposure in anterior pharyngotomy see Figs 114–118

After opening the pharynx the base of the tongue is adequately exposed by upward retraction of the hyoid bone or by excision of its central portion

366 Small or moderate-sized operative defects of the base of the tongue usually can be sutured before closure of the external wound by a composite suture



365 Position of the tumor and its excision



366 Closure of the wound.

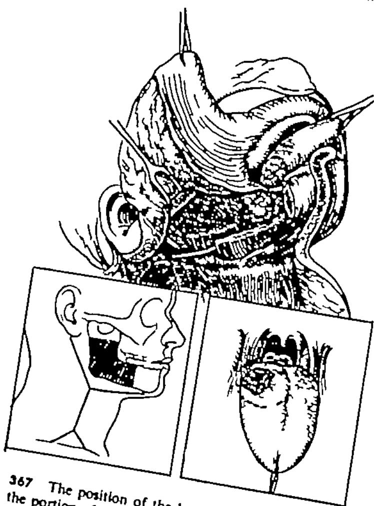
PARTIAL GLOSSECTOMY (Figs. 367–371)

WITH RESECTION OF THE MANDIBLE AND NECK DISSECTION

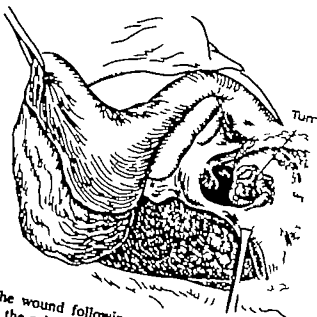
The combination operation (Commando) which includes the removal of a lesion in the mouth resection of the mandible and a neck dissection finds one of its greatest fields of usefulness for moderately and far advanced cancer of the tongue

The extent of resection of the tongue substance may vary from a partial excision up to a subtotal removal leaving only a narrow rim of tongue mucosa in the vallecula In most such operations the resection of bone has a dual purpose—first, to permit a safely wide margin and second, that the remaining tissues may be shifted to permit a primary closure Bone grafts or metal splints are not applicable in these cases since their insertion would prevent adequate shifting of soft tissues

367 368 The neck dissection and partial mandibulectomy have been performed to expose the primary lesion in the right base of the tongue The cheek flap has been laid back and a partial mandibulectomy has been completed.



367 The position of the lesion the incision and the portion of the mandible to be removed.

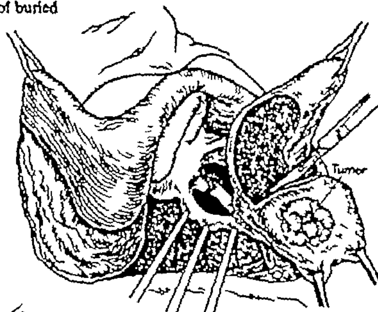


368 The wound following resection of the showing the primary lesion with the circum of incision.

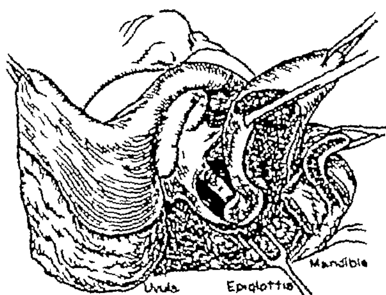
WITH RESECTION OF THE MANDIBLE AND NECK DISSECTION CONTINUED

369 370 The primary lesion in the base of the tongue is excised to about the midline and deeply into the substance of the tongue

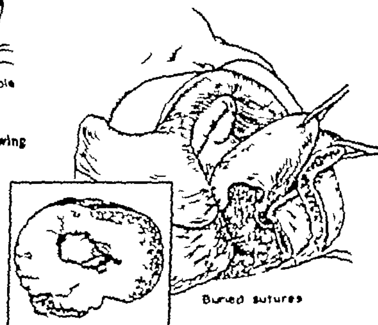
371 Closure is effected by approximating the cut edges of the mucosa with at least two layers of buried sutures.



369 Excision of the primary lesion.



370 The appearance of the operative wound following excision of the primary lesion



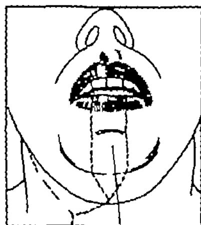
371 Closure of the wound.

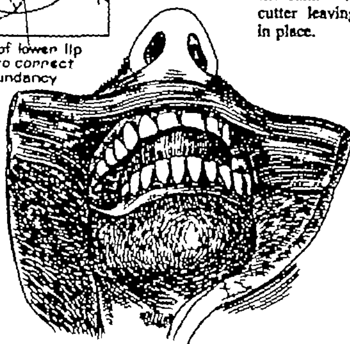
SUBTOTAL GLOSSECTOMY COMBINED WITH NECK DISSECTION

This extensive procedure is indicated only for growths deeply infiltrating the lingual musculature. Practically the whole body of the tongue back to the valleculae is resected To obtain an adequately wide margin and also to permit closure of the wound within the mouth the whole horizontal portion of the mandible is resected to permit suture of the mucosa of the lip to the anterior aspect of the epiglottis This operation is combined with a unilateral neck dissection but is justifiable also with a bilateral neck dis section.

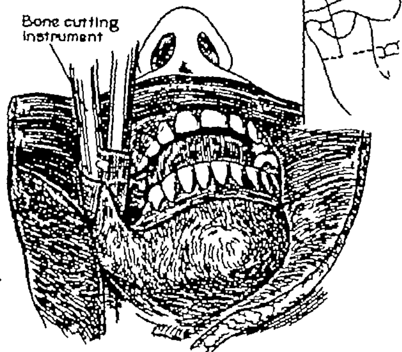
372 Neck dissection has been completed and tracheostomy tube has been inserted and to the anesthesia machine The anterior arm of Y incision is continued up over the lower lip a considerable segment of the mesial portion wise the lip would be redundant following closure For the position of the lesion itself see Fig 374

373 The lateral flaps are dissected back to the rami which are then cut across with a cutter leaving the coronoid and condyloid in place.





372 The position of the incision and preliminary development of the flaps.

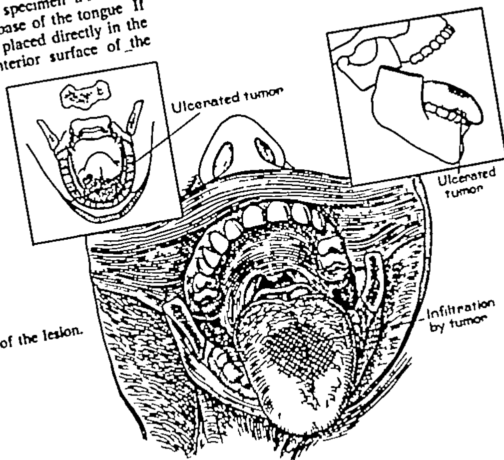


373 Section of the mandible.

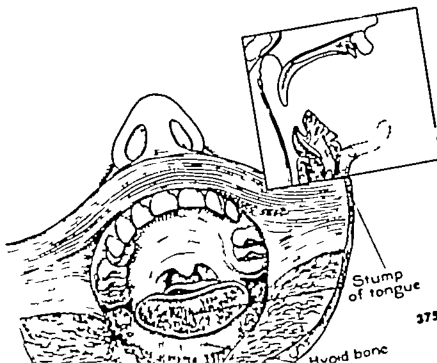
SUBTOTAL GLOSSECTOMY COMBINED WITH NECK DISSECTION CONTINUED

374 Once the rami have been sectioned the tongue and mandible may be reflected, exposing the tongue so that the lesion can be visualized The epiglottis and valleculae are brought forward into view

375 Following resection of the specimen a remnant of variable size remains at the base of the tongue If necessary the incision may be placed directly in the valleculae shaving off the anterior surface of the epiglottis



374 The position of the lesion.

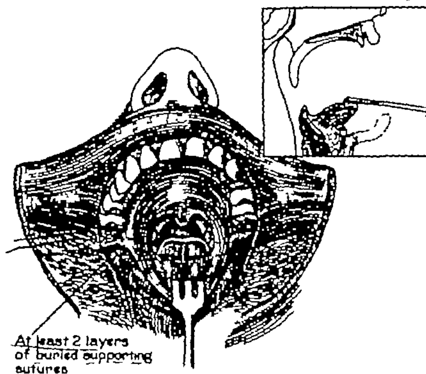


375 Complete removal of the surgical specim

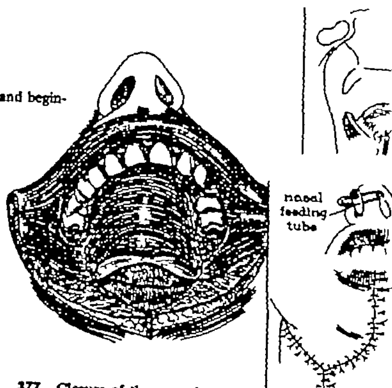
SUBTOTAL GLOSSECTOMY COMBINED WITH NECK DISSECTION CONTINUED

376 The fragment of muscle and mucosa at t valleculae is brought forward Closure of the muc is begun laterally and is supported by at least layers of buried sutures.

377 The layered soft tissue closure is continued completed, the base of the tongue being sutured the inner surface of the lip No raw surface is within the mouth Following completed closure, th is an "Andy Gump" appearance Prophylactic trac ostomy is essential.



376 The appearance of the operative defect and beginning closure of the wound.

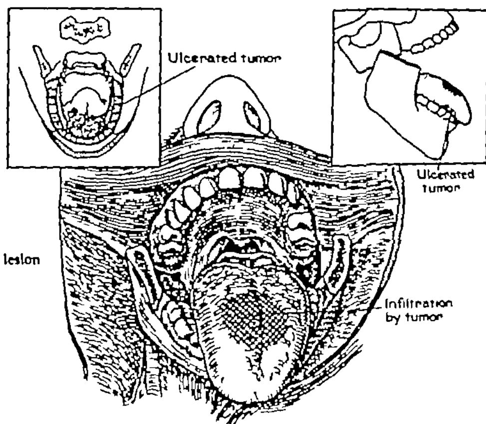


377 Closure of the wound

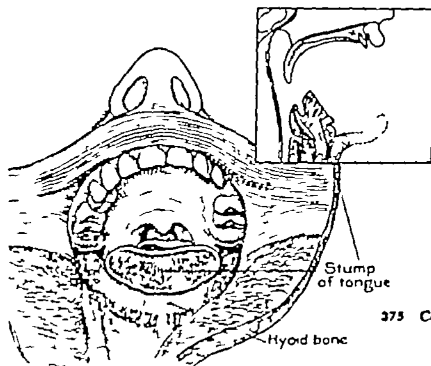
SUBTOTAL GLOSSECTOMY COMBINED WITH NECK DISSECTION CONTINUED

374 Once the rami have been sectioned the tongue and mandible may be reflected exposing the tongue so that the lesion can be visualized The epiglottis and valleculae are brought forward into view

375 Following resection of the specimen, a remnant of variable size remains at the base of the tongue If necessary the incision may be placed directly in the valleculae shaving off the anterior surface of the epiglottis



374 The position of the lesion

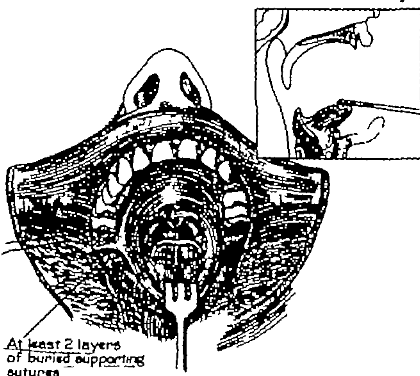


375 Complete removal of the surgical specimen

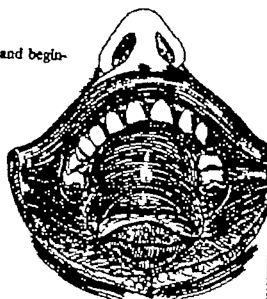
SUBTOTAL GLOSSECTOMY COMBINED WITH NECK DISSECTION *CONTINUED*

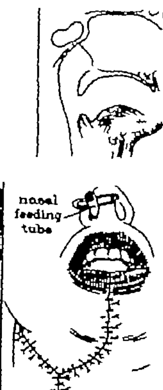
376 The fragment of muscle and mucosa at the valleculae is brought forward Closure of the mucosa is begun laterally and is supported by at least two layers of buried sutures

377 The layered soft tissue closure is continued and completed, the base of the tongue being sutured to the inner surface of the lip No raw surface is left within the mouth Following completed closure there is an "Andy Gump" appearance Prophylactic tracheostomy is essential.



376 The appearance of the operative defect and beginning closure of the wound



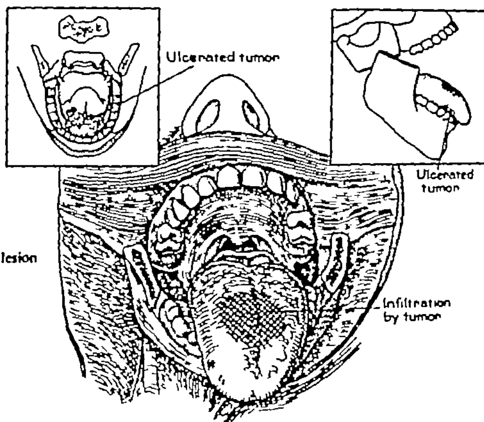


377 Closure of the wound.

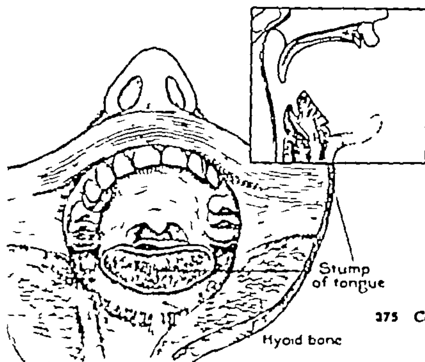
SUBTOTAL GLOSSECTOMY COMBINED WITH NECK DISSECTION CONTINUED

374 Once the rami have been sectioned the tongue and mandible may be reflected exposing the tongue so that the lesion can be visualized The epiglottis and valleculae are brought forward into view

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374 The position of the lesion

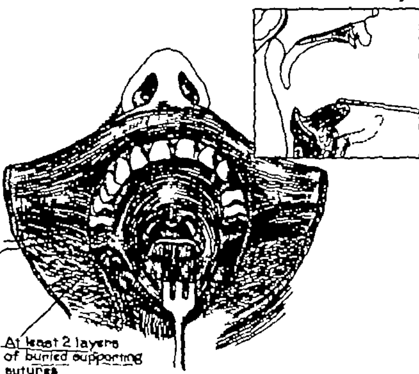


375 Complete removal of the surgical specimen

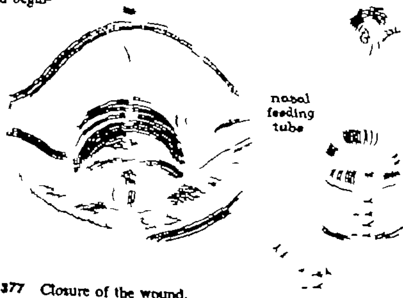
SUBTOTAL GLOSSECTOMY COMBINED WITH NECK DISSECTION CONTINUED

376 The fragment of muscle and mucosa at the valleculae is brought forward Closure of the mucosa is begun laterally and is supported by at least two layers of buried sutures

377 The layered soft tissue closure is continued and completed, the base of the tongue being sutured to the inner surface of the lip No raw surface is left within the mouth Following completed closure, there is an "Andy Gump" appearance Prophylactic tracheostomy is essential.



376 The appearance of the operative defect and beginning closure of the wound.



377 Closure of the wound.

Chapter 16

OPERATIONS FOR GROWTHS OF THE FLOOR OF THE MOUTH

OPERATIONS FOR GROWTHS OF THE FLOOR OF THE MOUTH (Figs. 378–380)

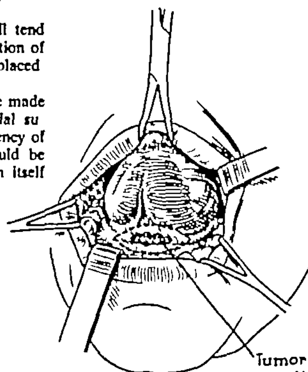
SIMPLE ELLIPTICAL EXCISION FOR SUPERFICIAL CANCER

Cancers of the floor of the mouth even when small may invade the inner surface of the gum and necessitate some resection of bone (alveolus) Strictly local excision (without removal of any bone) should be limited to those growths of the floor of the mouth with an adequate margin—at least 1 cm distant from the inner surface of the gum Marginal resection of the mandible usually is indicated in floor-of-the mouth lesions

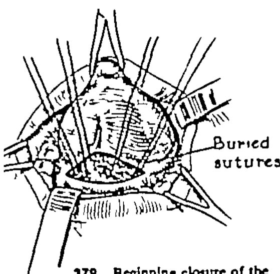
378 This procedure should be used only for small lesions separate from the inner surface of the gum

379 The deeper portions of the wound will tend to separate and in order to prevent the formation of hematoma a layer of deep sutures should be placed

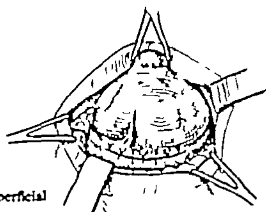
380 Closure of the mucosal edges should be made *by alternating vertical mattress and superficial su tures* There need be no concern over the patency of the submaxillary ducts and no attempt should be made to locate them Drainage will establish itself automatically



378 The incision.



379 Beginning closure of the wound under a layer of buried sutures.



380 Closure of the superficial wound

MARGINAL RESECTION OF THE MANDIBLE FOR CANCER OF THE ANTERIOR FLOOR OF THE MOUTH

This type of operation is particularly suited to growths of the anterior floor of the mouth too extensive for local excision alone in which there is no palpable evidence of cervical metastases, and in which the central location of the growth makes possible later metastases to either or both sides of the neck For this reason neck dissection had best be omitted until there is clinical evidence of cervical lymph node involvement.

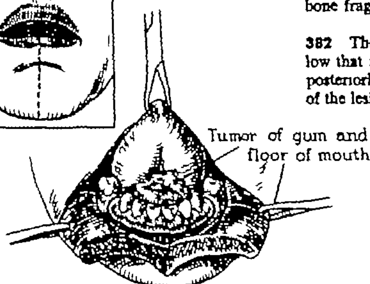
Should there be any question of the propriety of leaving the lower rim of mandible it should be remembered that the margin of safety in this direction is as wide leaving a rim of bone as is a reasonable width of margin posteriorly and laterally

Following this operation there is almost always swelling and protrusion of the anterior portion of the tongue. There need be no concern as to the permanence of this deformity The swelling always subsides and the tongue recedes into the floor of the mouth within two or three weeks Since the openings of the submaxillary ducts are excised as part of the operation, there is always some stasis, accompanied by swelling of the submaxillary salivary glands, which may later raise the question of submaxillary metastasis The glands eventually atrophy

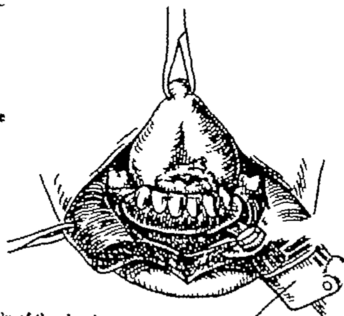
381 The lower lip is split in the midline just short of the point of the chin. The alveolar process adjacent to the lesion should be outlined by an incision through the gum tissue, preparatory to removal of a bone fragment.

382 The bone is cut through at a level sufficiently low that a continuation of the excision may proceed posteriorly at a fairly deep level beneath the base of the lesion





381 Position of the incision and preliminary exposure of the lesion.



382 Excision of a margin of the alveolar process.

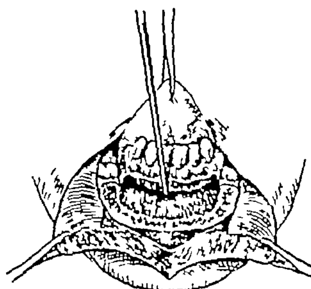
OPERATIONS FOR GROWTHS OF THE FLOOR OF THE MOUTH (Figs 381–388)

MARGINAL RESECTION OF THE MANDIBLE FOR CANCER OF THE ANTERIOR FLOOR OF THE MOUTH CONTINUED

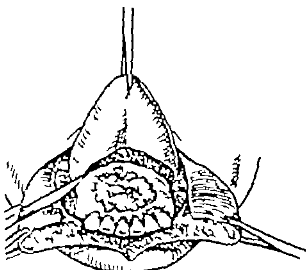
383 After the saw cut has been completed the bone fragment is pulled upward exposing the deep tissues of the floor of the mouth

384 385 Retracting the tongue upward the tumor is circumscribed above at the safe margin established by an incision on the undersurface of the tongue

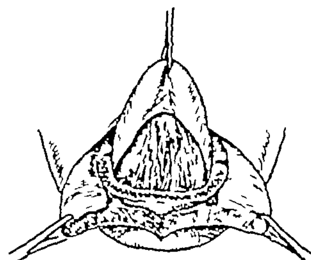
386 Closure is first begun by approximating the mucosa and then continued with support by layered buried closure of the soft parts



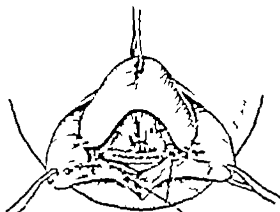
383 Mobilization of the bone fragment.



4 Circumscribing the lesion superiorly



385 The appearance of the operative field following removal of the lesion.

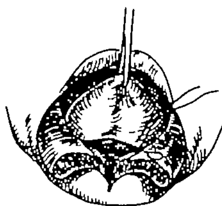


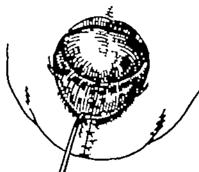
386 Beginning closure of the wound.

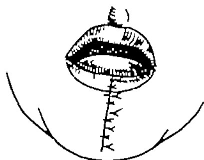
MARGINAL RESECTION OF THE MANDIBLE FOR CANCER OF THE ANTERIOR FLOOR OF THE MOUTH CONTINUED

387 At the completion of closure the undersurface of the tongue has been sutured directly to the mucosa of the inner surface of the lip

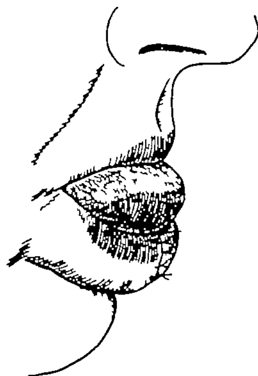
388 The swelling and extrusion of the tongue may increase for the first few days No fear need be entertained as to the ultimate outcome After two or three weeks the tongue will recede to its normal position in the floor of the mouth and the external appearance will be normal.







387 The completed closure of the wound.



388 The appearance of the swollen tongue the day after operation.

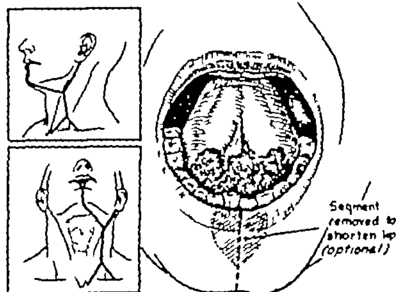
OPERATIONS FOR GROWTHS OF THE FLOOR OF THE MOUTH (Figs 389–393)

EXCISION OF CANCER OF THE ANTERIOR FLOOR OF THE MOUTH COMBINED WITH MARGINAL RESECTION OF THE MANDIBLE AND NECK DISSECTION

A wide and deep marginal resection of the anterior portion of the mandible is sometimes indicated in the presence of cervical metastasis requiring a neck dissection

389 The operation is begun by a neck dissection and the incision continued up to split the lower lip in the midline Removal of the wedge of the central portion of the lip is optional.

390 The neck dissection has been completed and the lateral cheek flaps have been laid back The dotted line indicates the line of the marginal resection.



389 Primary lesion and the incision

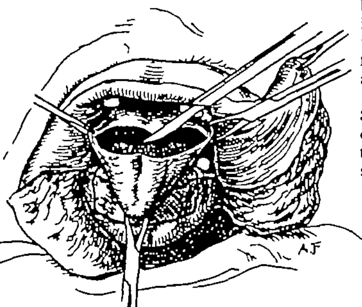


390 The line of marginal resection of bone.

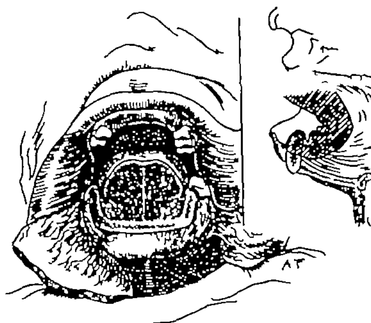
EXCISION OF CANCER OF THE ANTERIOR FLOOR OF THE MOUTH COMBINED WITH MARGINAL RESECTION OF THE MANDIBLE AND NECK DISSECTION CONTINUED

391 392 The bone fragment has been mobilized by a vibratory saw The anterior third of the tongue is amputated and the incision is carried deeply into the floor of the mouth The tip of the tongue the floor of the mouth, and marginal section of mandible are removed *en bloc*

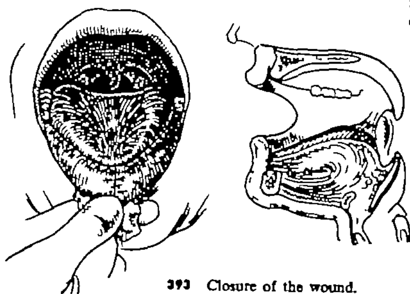
393 The wound is closed by suturing the stump of the tongue to the mucosa of the inner surface of the lip closure being supported by layers of buried sutures



391 Amputation of the tip of the tongue.



392 The appearance of the wound following , of the surgical specimen



393 Closure of the wound.

OPERATIONS FOR GROWTHS OF THE FLOOR OF THE MOUTH (Figs 394–397)

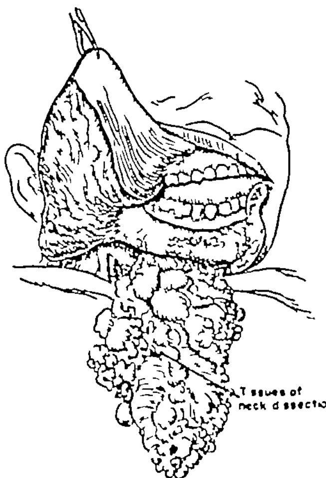
THE PULL THROUGH OPERATION—MARGINAL RESECTION OF THE MANDIBLE FOR CANCER OF THE LATERAL FLOOR OF THE MOUTH COMBINED WITH NECK DISSECTION

Marginal resection of the mandible is sometimes suitable for cancer of the lateral floor of the mouth If the cases are selected judiciously a lower rim of the mandible may be safely preserved

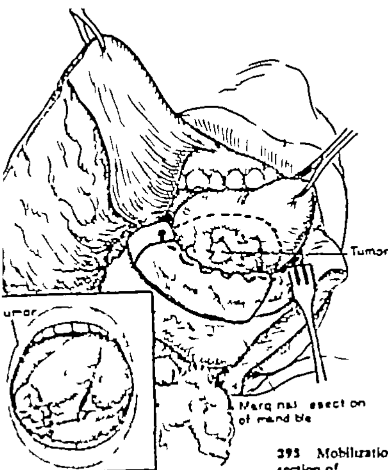
The "pull through" technic highly idealistic in concept but rather impractical in its execution, is shown in the following diagrams as a matter of record In most cases it will be found best to omit the "pull through" phase and to remove the primary lesion and portion of bone from above.

394 The radical neck dissection has been performed and the lesion left attached to the submaxillary area The lower lip has been split in the midline and the cheek flap retracted.

395 With a vibratory bone saw marginal resection of the alveolus has been made adjacent to the tumor The dotted line shows the line of incision to circumscribe the primary lesion.



394 The appearance at completion of neck dissection

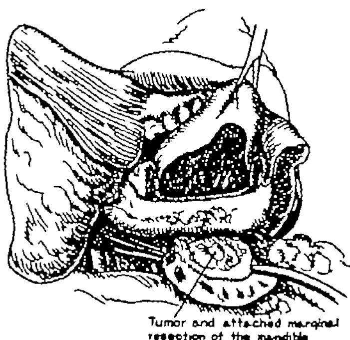


395 Mobilization of the bony alveolus for marginal resection of le.

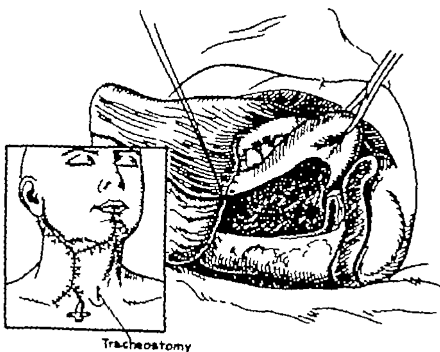
THE "PULL-THROUGH" OPERATION CONTINUED

396 After mobilization of the primary lesion the specimen, including the bone fragment, is pushed and pulled downward through the floor of the mouth supposedly remaining attached to the neck dissection specimen.

397 The mucosal incision is closed by sutures supported by a layered closure of the soft parts Prophylactic tracheostomy is prudent.



396 The "pull-through" maneuver



397 Closure of the incision.

OPERATIONS FOR GROWTHS OF THE FLOOR OF THE MOUTH (Figs 394–397)

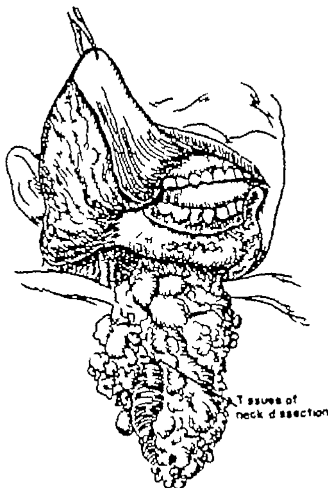
THE "PULL THROUGH" OPERATION—MARGINAL RESECTION OF THE MANDIBLE FOR CANCER OF THE LATERAL FLOOR OF THE MOUTH COMBINED WITH NECK DISSECTION

Marginal resection of the mandible is sometimes suitable for cancer of the lateral floor of the mouth If the cases are selected judiciously a lower rim of the mandible may be safely preserved.

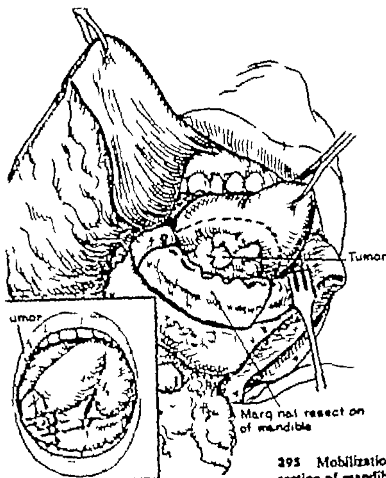
The "pull-through" technic highly idealistic in concept but rather impractical in its execution is shown in the following diagrams as a matter of record. In most cases it will be found best to omit the "pull-through" phase and to remove the primary lesion and portion of bone from above

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395 With a vibratory bone saw, marginal resection of the alveolus has been made adjacent to the tumor The dotted line shows the line of incision to circumscribe the primary lesion



394 The appearance at completion of neck dissection.

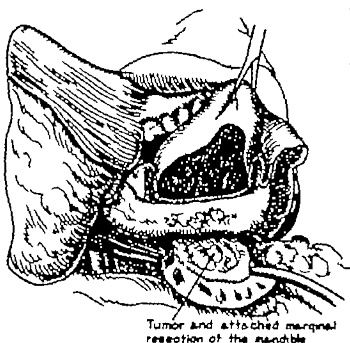


395 Mobilization of the bony alveolus for marginal resection of mandible.

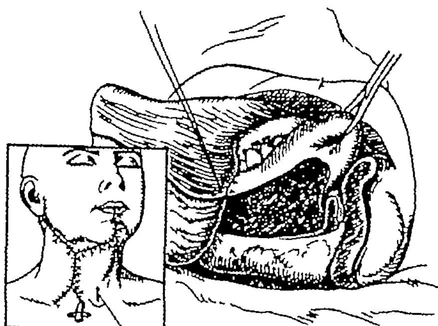
THE "PULL-THROUGH" OPERATION CONTINUED

396 After mobilization of the primary lesion the specimen including the bone fragment, is pushed and pulled downward through the floor of the mouth, supposedly remaining attached to the neck dissection specimen.

397 The mucosal incision is closed by sutures supported by a layered closure of the soft parts Prophylactic tracheostomy is prudent.



396 The "pull-through" maneuver



397 Closure of the incision.

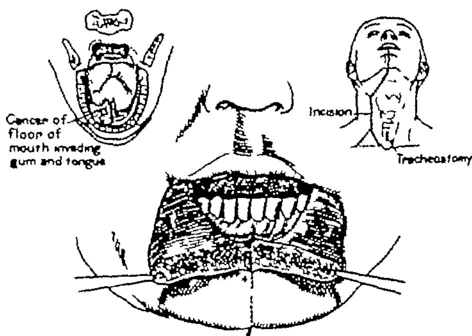
OPERATIONS FOR GROWTHS OF THE FLOOR OF THE MOUTH (Figs 398–405)

EXCISION OF EXTENSIVE PRIMARY CANCER OF THE FLOOR OF THE MOUTH COMBINED WITH PARTIAL RESECTION OF THE MANDIBLE AND NECK DISSECTION

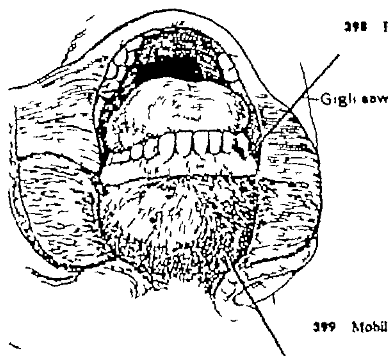
This extensive operation for cancer of the floor of the mouth closely resembles that for moderately extensive cancer of the lateral aspect of the tongue (see Figs 367–371)

398 Neck dissection has already been performed The anterior arm of the upper Y is continued splitting the lower lip If more than half the mandible is to be removed the lower lip should be shortened by removal of a central segment.

399 Lateral cheek flaps are laid back by incisions in the gingivobuccal gutters.



398 Position of the lesion and preliminary exposure

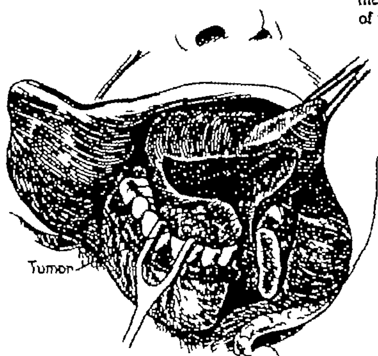


399 Mobilization of the cheek flaps.

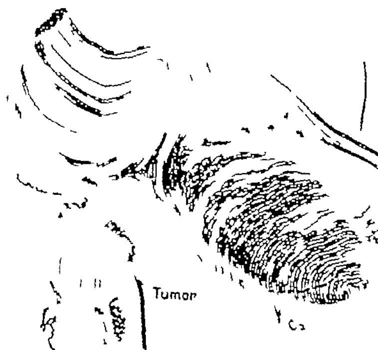
EXCISION OF EXTENSIVE PRIMARY CANCER OF THE FLOOR OF THE MOUTH COMBINED WITH PARTIAL RESECTION OF THE MANDIBLE AND NECK DISSECTION CONTINUED

400 After sectioning the mandible with a Gigli saw the incision is carried deeply into the tongue and floor of the mouth to widely encompass the growth

401 Dissection is continued backward to the temporomandibular joint A dotted line is shown crossing the tip of the tongue, which should be excised if the resection of the primary lesion crosses the midline of the floor of the mouth



400 Mobilization of the specimen to be excised.



401 Continued mobilization of the surgical specimen.

EXCISION OF EXTENSIVE PRIMARY CANCER OF THE FLOOR OF THE MOUTH COMBINED WITH PARTIAL RESECTION OF THE MANDIBLE AND NECK DISSECTION CONTINUED

402 The mandibular fragment can be disarticulated at the temporomandibular joint or the ascending ramus can be cut across with a bone cutter (see Fig 373)

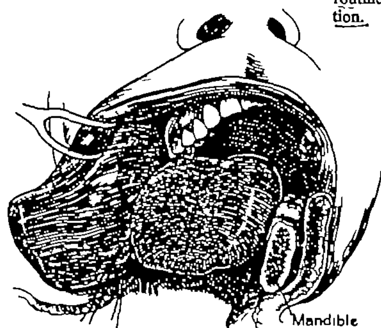
403 The mucosal suture is supported by two or three layers of buried chromic sutures

402 Disarticulation at the temporomandibular joint

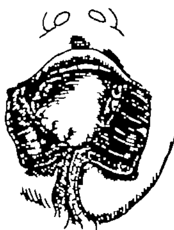
403 The appearance of the wound following removal of the surgic specimen and beginning of the closure

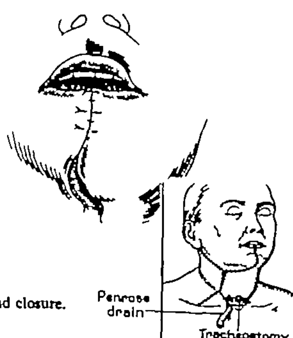
EXCISION OF EXTENSIVE PRIMARY CANCER OF THE FLOOR OF THE MOUTH COMBINED WITH PARTIAL RESECTION OF THE MANDIBLE AND NECK DISSECTION CONTINUED

404 405 The closure of the wound continues in the mouth with at least two layers of buried sutures and finally is completed over the lower lip and down into the neck wound A prophylactic tracheostomy routinely should be made at the close of the operation.



404 Continuation of wound closure.





405 Final steps in wound closure.

OPERATIONS FOR GROWTHS OF THE FLOOR OF THE MOUTH (Figs 406–408)

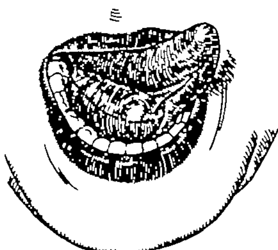
EXCISION OF SALIVARY CYST (RANULA) OF THE FLOOR OF THE MOUTH

The erroneous belief persists that "ranula" (*L*—a little frog) is due to dilatation of the Wharton's duct following obstruction at its orifice On the basis of this error one of the traditional methods of treatment for ranula has been simple drainage or even the introduction of a seton. The lesion actually is a retention cyst of a minor mucous and/or salivary gland, and as such has no connection either with the submaxillary gland or Wharton's duct Simple incision or the insertion of a seton therefore, cannot accomplish the cure The proper treatment is the complete removal of the cyst by sharp and blunt dissection

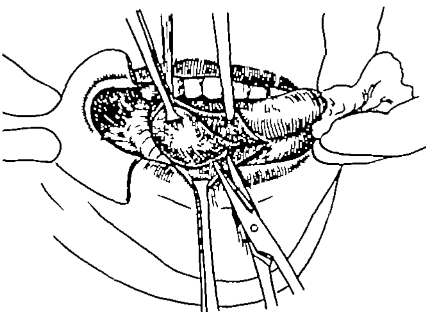
406 The incision is made over the most prominent portion of the cyst.

407 When the cyst wall is reached it is carefully mobilized by sharp and blunt dissection, care being taken not to penetrate the cyst wall itself

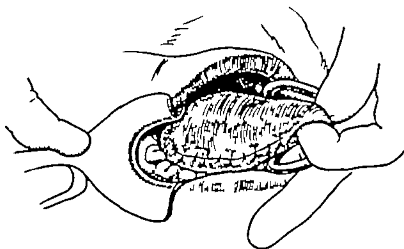
408 The incision is closed without drainage



406 The incision



407 Mobilization of the cyst.



408 Closure of the incision.

Chapter 17

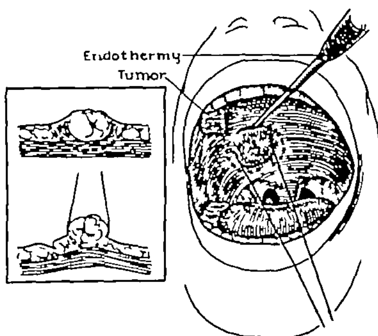
OPERATIONS FOR TUMORS OF THE PALATE

EXCISION OF SMALL TUMOR OF THE HARD OR SOFT PALATE AND CLOSURE BY SECONDARY INTENTION

After the excision of small superficial tumors of the hard palate and the immediately adjacent soft palate the resulting defects cannot be closed by primary suture and therefore are left to heal by granulation and secondary intention Larger superficial defects may be closed by skin grafting Through and-through defects of the hard palate if small (1 cm or less) often close spontaneously by scarring. The larger defects of the hard palate remain permanently and are adequately relieved by prostheses

Care should be taken to avoid unnecessary through and-through defects of the soft palate by elevating and partly immobilizing the tumor by a suture passed just under it. Either scalpel or endothermy may be used to circumscribe and excise the growth

409 The suture is placed temporarily under the tumor to raise it from its bed and to mobilize the local tissues With endothermy actual cautery or the scalpel the tumor is removed and the wound left open to heal by granulation



409 Excision of the tumor by actual cautery or endothermy

EXCISION OF SUPERFICIAL WARTY BENIGN TUMORS OF THE HARD PALATE AND CLOSURE BY SKIN GRAFT

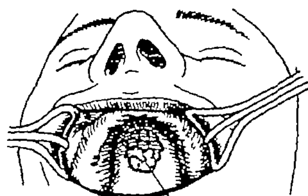
Occasionally warty noninfiltrating papillary growths involve the central portion of the hard palate Deep excision of underlying bone is not justified Healing may be greatly delayed and associated with marked scarring if the wound is left to heal by secondary intention. A split skin graft on a stent is somewhat troublesome and requires careful preparation of apparatus, but otherwise it is useful in obtaining fairly prompt healing and a true epithelial covering.

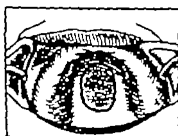
410 A superficial warty growth on the hard palate and the operative defect that remains if the growth is excised down to the periosteum of the hard palate

411 A special prosthesis constructed by a dentist is faced on its upper surface with soft rubber and is provided with two curved arms projecting from its anterior aspect. The split-skin graft, raw surface out ward, has been fastened to the prosthesis with glue

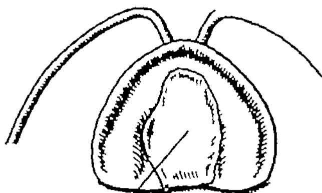
412 The apparatus is inserted so that the graft overlies the defect. The prosthesis is held in place by *elastic bands on a headpiece of netting.*

413 The apparatus is left in place for 7–8 days before removal.

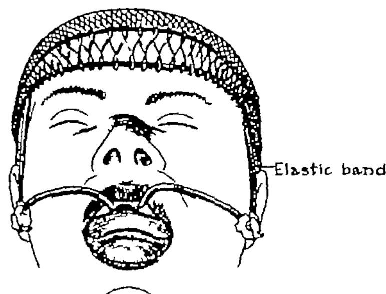




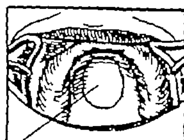
410 The growth and the operative defect.



411 The skin graft on a specially constructed



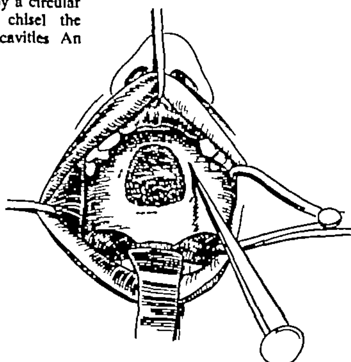
412 The prosthesis and the graft in place.



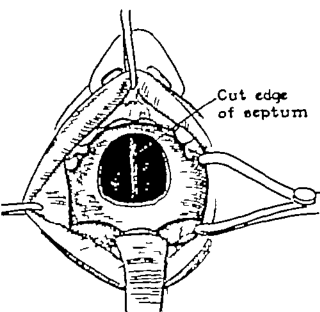
EXCISION OF DEEPLY-INFILTRATING TUMORS OF THE HARD PALATE ON OR INVADING THE BONE

Malignant tumors of the central portion of the hard palate invariably lie on or invade the bone Although the initial disability is consider able the underlying bone must be excised, leaving a permanent opening in the nasal cavities The latter defect is satisfactorily closed by a dental prosthesis

414 415 The tumor is circumscribed by a circular incision with the scalpel and, using a chisel the palate is cut through, entering the nasal cavities An adequate margin of septum is removed



414 Removal of the tumor



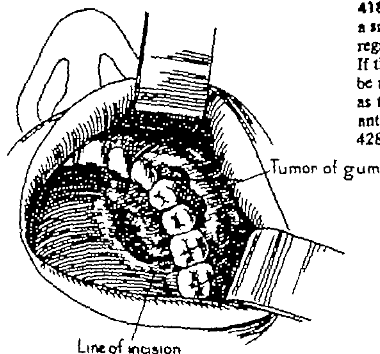
415 The appearance of the palate following wide excision

EXCISION OF MODERATE SIZED TUMOR OF THE UPPER GUM AND PALATE

In cancer of the upper gum when the lesion is relatively superficial and of moderate size a local excision of the growth with the underlying alveolar process sometimes may be adequate without opening into the antrum This conservative operation should not be used for the more extensive lesions

416 417 After extraction of two teeth the incision is carried down to the bone with a scalpel, with a chisel the underlying bone then is excised in an oblique direction, attempting to avoid opening into the antrum.

418 After the removal of the operative specimen, a small opening into the maxillary antrum may be disregarded and expected to heal by secondary intention If the opening is fairly large the antral mucosa should be removed by curette If the resection is so extensive as to remove the entire floor of the antrum, then the antral cavity should be lined by a skin graft (see Fig. 428)

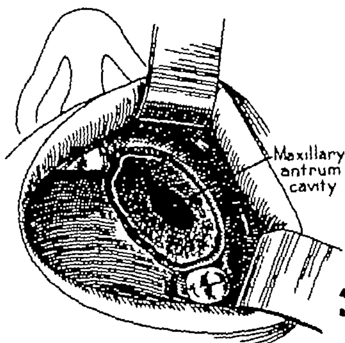


416 The line of incision





417 Removal of the growth.



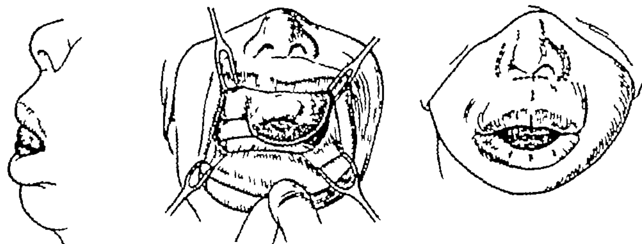
418 Appearance of the wound opening into the antrum

PARTIAL EXCISION OF MAXILLA AND PALATE FOR OSTEOGENIC TUMORS

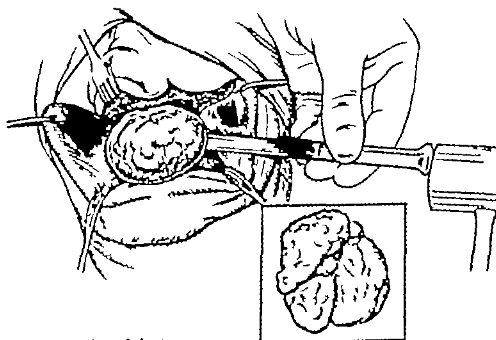
Osteogenic sarcoma of the bones of the face commonly arises on the basis of preëxisting Paget's disease or if of idiopathic origin tends to possess no distinct border so that excision is of uncertain permanent value Sarcoma of the maxilla tends to fungate into the mouth and to present a bulky sloughing malodorous tumor for which some form of palliative removal is called The operative procedure outlined below is an example of one such form of resection

419 The upper lip is split in the midline and the incision carried along the alae of the nose in order to mobilize the two lateral flaps of the upper lip

420 The tumor is mobilized mainly by the use of a chisel and mallet and the operative specimen is pried loose from its bed.



419 The tumor and incision.

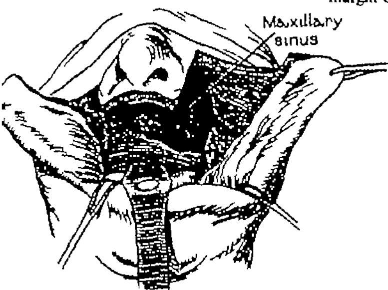


420 Mobilization of the tumor

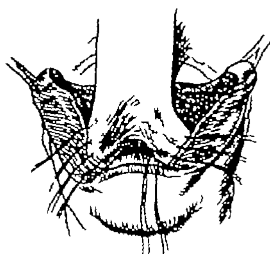
PARTIAL EXCISION OF MAXILLA AND PALATE FOR OSTEOGENIC TUMORS CONTINUED

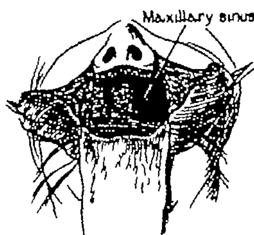
421 Following removal of the centrally placed bulky tumor and the upper jaw, the defect will enter the maxillary antrum

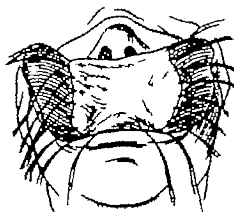
422 A split-skin graft is sutured to the mucosa of the upper lip The graft is then pushed backward to line the cavity and is attached posteriorly to the margin of the palatal defect.

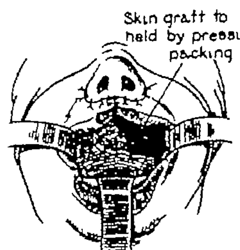


421 The operative defect.









422 Skin grafting and closure of the wound

Chapter 18

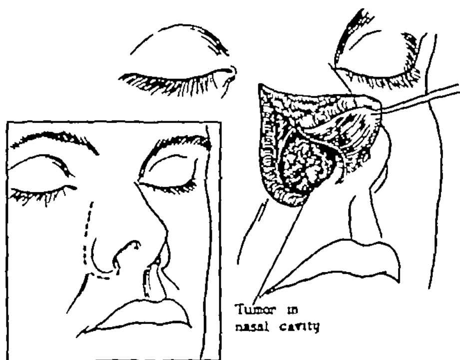
OPERATIONS FOR TUMORS OF THE NASAL CAVITY

LATERAL RHINOTOMY

This operation is useful mainly for small benign tumors or for small basal-cell carcinomas just within the anterior naris.

Growths of the anterior aspect of the nasal cavities may be approached through simple rhinotomy laying back one ala Lesions of the midportion upper or posterior portion of the nasal cavity cannot be exposed adequately through the anterior naris, and therefore must be approached through the alveolar process, either directly or by laying back a lateral upper lip and cheek flap Only benign tumors of the nasopharynx (such as juvenile angiofibroma) are surgically resectable.

423 An incision is made beginning in the floor of the nasal cavity within the naris going around the ala and running up toward the inner canthus The lateral nasal flap is elevated for exposure of anteriorly placed tumors The incision is closed in the conventional manner with a nasal packing as part of the dressing

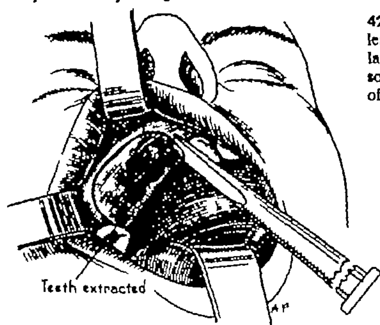


423 The incision and preliminary exposure

APPROACH TO THE NASAL CAVITY THROUGH THE ALVEOLAR PROCESS VIA ANTROSTOMY

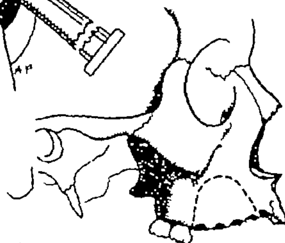
This approach permits a wider though still limited, exposure of the nasal cavity through a partial resection of the alveolar process and removal of the party wall between the antrum and the nasal cavity It does not necessarily include curettement of the antral mucosa and its replacement by skin graft

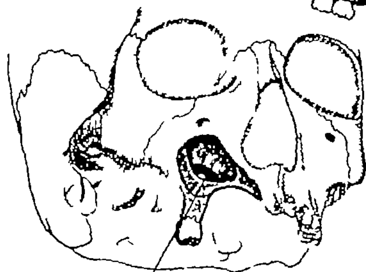
This somewhat conservative exposure should be limited mainly to benign tumors (e g. bulky polyps of the nasal cavities) The same exposure is useful for benign tumors of the maxillary antrum.



424 The incision

424 425 If teeth are present in the upper jaw at least 3 or 4 should be withdrawn beginning with the lateral incisor An incision is then made through the soft parts of the gum and palate outlining the area of bone to be resected with a chisel and/or bone saw







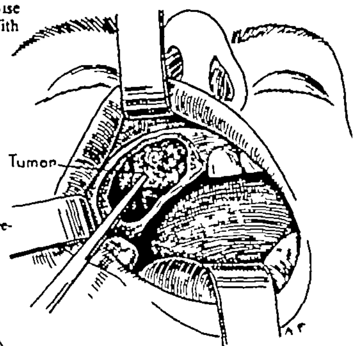
425 Diagrammatic representation of the amount of bone excised in antrostomy f approach to the nasal cavity

OPERATIONS FOR TUMORS OF THE NASAL CAVITY (Figs. 424–428)

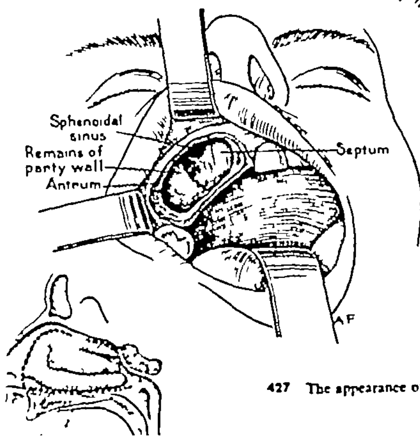
APPROACH TO THE NASAL CAVITY THROUGH THE ALVEOLAR PROCESS VIA ANTROSTOMY CONTINUED

426 A benign tumor immediately comes into view unless it is in the nasal cavity when it appears only after resection of the party wall

427 *A* After resection of the party wall (including the turbinates) the ethmoid and sphenoid sinuses may be curetted. *B* Diagrammatic representation of the area of party wall which can be excised through antrostomy Usually it is best to remove by curette the mucous membrane lining of the antrum otherwise troublesome edematous polyps tend to develop With out skin graft the nasal cavity is left to cicatrize



426 The appearance after removal of the bony alveolus.

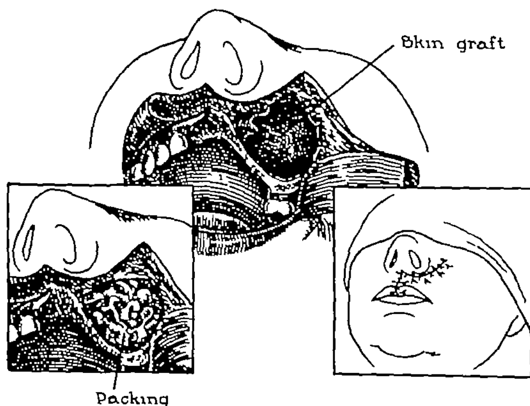


427 The appearance of the wound after completion of the operation

APPROACH TO THE NASAL CAVITY THROUGH THE ALVEOLAR PROCESS VIA ANTROSTOMY

CONTINUED

428 When the operative procedure must include a curettage of the antrum and removal of the mucous membrane lining, a split-skin graft should be applied A split-thickness skin graft from the abdominal wall is placed in the cavity and held in proximation by packing that is left in place for at least 6 days.

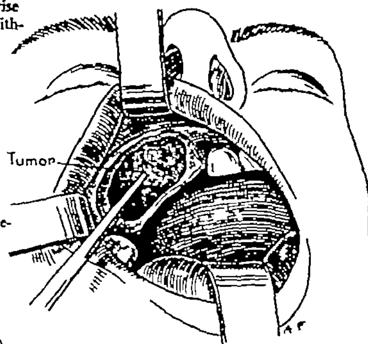


428 The application of skin graft.

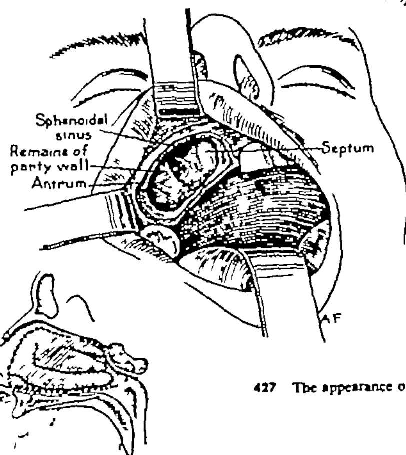
APPROACH TO THE NASAL CAVITY THROUGH THE ALVEOLAR PROCESS VIA ANTROSTOMY
CONTINUED

426 A benign tumor immediately comes into view unless it is in the nasal cavity when it appears only *after resection of the party wall*

427 *A* After resection of the party wall (including the turbinates) the ethmoid and sphenoid sinuses may be curetted. *B* Diagrammatic representation of the area of party wall which can be excised through antrostomy Usually it is best to remove by curette the mucous membrane lining of the antrum otherwise troublesome edematous polyps tend to develop Without skin graft the nasal cavity is left to cicatrize.



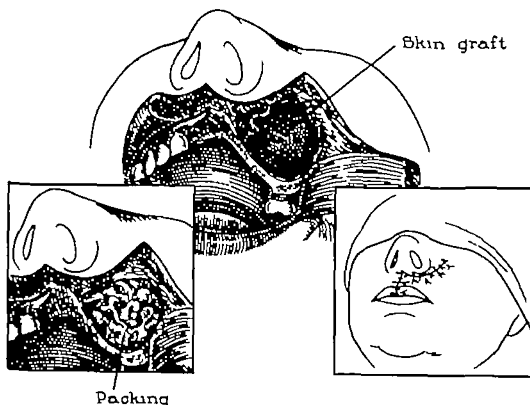
426 The appearance after removal of the bony alveolus.



427 The appearance of the wound after completion of the operation.

APPROACH TO THE NASAL CAVITY THROUGH THE ALVEOLAR PROCESS VIA ANTROSTOMY
CONTINUED

428 When the operative procedure must include a curettage of the antrum and removal of the mucous membrane lining, a split-skin graft should be applied A split-thickness skin graft from the abdominal wall is placed in the cavity and held in proximation by packing that is left in place for at least 6 days.



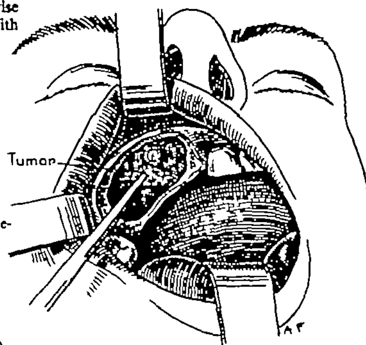
428 The application of skin graft.

OPERATIONS FOR TUMORS OF THE NASAL CAVITY (Figs 424–428)

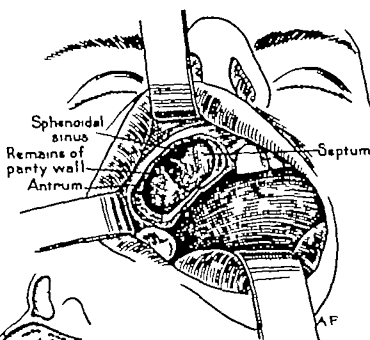
APPROACH TO THE NASAL CAVITY THROUGH THE ALVEOLAR PROCESS VIA ANTROSTOMY
CONTINUED

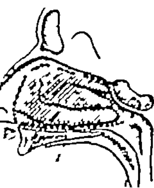
426 A benign tumor immediately comes into view unless it is in the nasal cavity when it appears only after resection of the party wall

427 *A* After resection of the party wall (including the turbinates) the ethmoid and sphenoid sinuses may be curetted *B* Diagrammatic representation of the area of party wall which can be excised through antrostomy Usually it is best to remove by curette the mucous membrane lining of the antrum otherwise troublesome edematous polyps tend to develop Without skin graft the nasal cavity is left to cicatrize



426 The appearance after removal of the bony alveolus

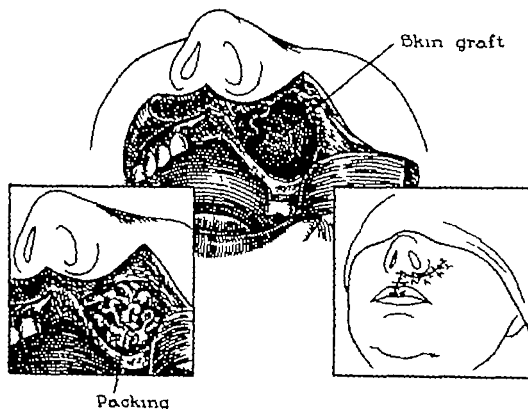




427 The appearance of the wound after completion of the operation.

APPROACH TO THE NASAL CAVITY THROUGH THE ALVEOLAR PROCESS VIA ANTROSTOMY
CONTINUED

428 When the operative procedure must include a curettage of the antrum and removal of the mucous membrane lining, a split-skin graft should be applied. A split-thickness skin graft from the abdominal wall is placed in the cavity and held in proximation by packing that is left in place for at least 6 days



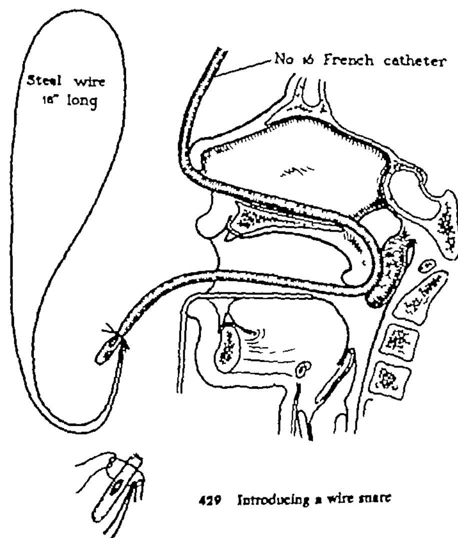
428 The application of skin graft.

OPERATIONS FOR TUMORS OF THE NASAL CAVITY (Figs. 429–432)

SNARE REMOVAL OF POLYPOID NASOPHARYNGEAL TUMORS

Bulky benign polyps may arise from the walls of the nasopharynx and fungate on a rather narrow pedicle downward to appear below the free edge of the soft palate Many of these especially those with a narrow pedicle *can be removed by a snare, thereby avoiding* the more deforming methods of approach through the alveolar process or hard palate The average wire snare is not sturdy enough to cut through the pedicle of some of the more fibrous tumors and a heavier modification of *the snare is required*

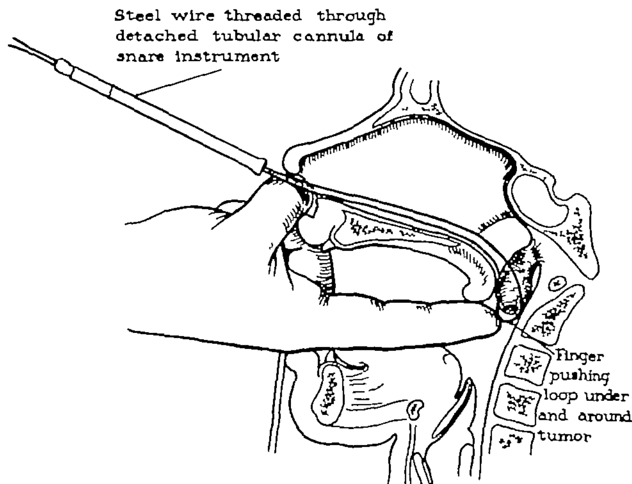
429 A catheter is passed back through a nasal cavity the end grasped and pulled out of the mouth for attachment to a loop of steel wire The latter is then pulled back into the pharynx to emerge at the anterior naris



429 Introducing a wire snare

SNARE REMOVAL OF POLYPOID NASOPHARYNGEAL TUMORS CONTINUED

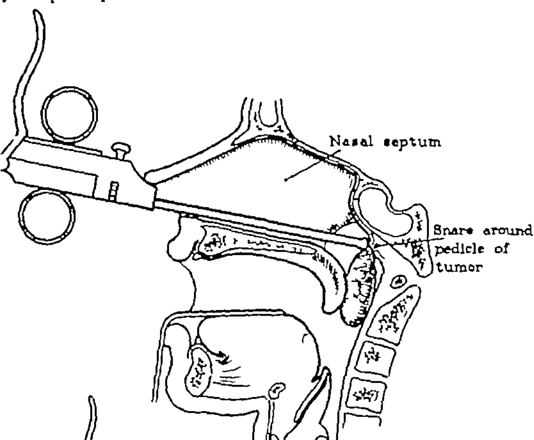
430 The two ends of the loop are threaded through the cannula of the snare and the loop itself passed back of the pedicle of the polyp with the help of the palpating finger



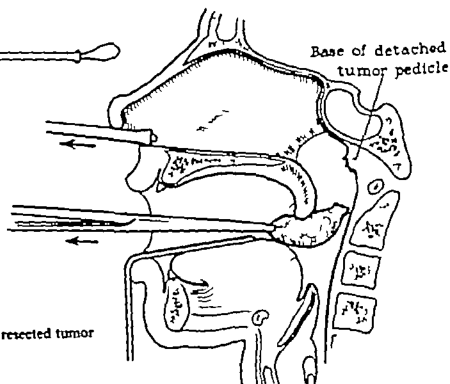
430 Placement of the loop to surround the base of the polyp

NARE REMOVAL OF POLYPOID NASOPHARYNGEAL TUMORS CONTINUED

31 432 The ends of the wire are pulled into the annula, severing the pedicle The tumor is grasped y forceps and pulled out of the mouth



431 Cutting through the pedicle.



432 Removal of the resected tumor

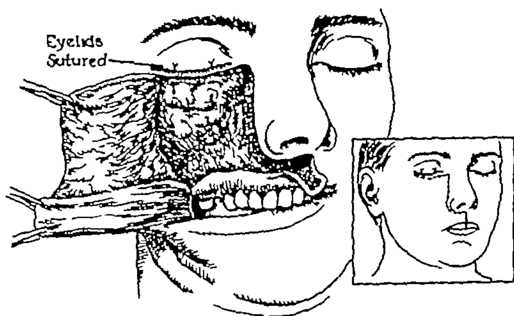
Chapter 19

OPERATIONS ON THE ANTRUM AND MAXILLA

PARTIAL RESECTION OF THE MAXILLA FOR EARLY CANCER OF THE ANTRUM

Partial resection of the maxilla is indicated for malignant tumors in the following sites *1* upper gum and/or palate (deeply-infiltrating lesions) *2* lower anterior walls of the antrum *3* anterior lower wall of the nasal cavity (party wall) Partial resection should not be used for antral growths involving the superior wall (floor of orbit) or extending into the ethmoid sphenoid region In these cases radical resec of the maxilla should be made including ex teration of the orbit The anesthesia breat tube in most cases should be inserted thro the mouth rather than through the nasal ca

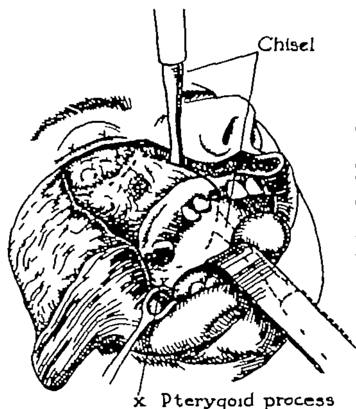
433 Sutures of silk or nylon are placed temporarily to fuse the eyelids for protection of the cornea A Weber Fergusson incision is made keeping close to the ala running up to the inner canthus and then laterally close to the palpebral margin.



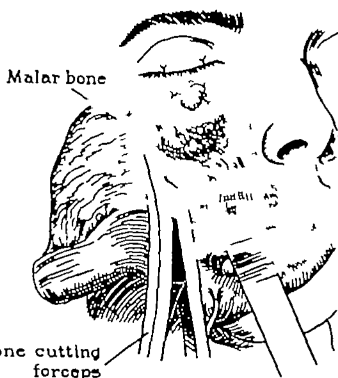
433 Skin incision and superficial flap

PARTIAL RESECTION OF THE MAXILLA FOR EARLY CANCER OF THE ANTRUM CONTINUED

434 435 436 Usually one or two teeth are extracted along the line of the incision across the alveolus With the chisel or vibratory saw the anterior wall of the maxilla and the palate is cut through Care should be taken to slant the direction of the chisel or bone saw downward along the infraorbital ridge to avoid entering the bony orbit A bone-cutting forceps may be used to sever the malar bone The specimen is then pried loose by bone holding forceps, chisels and heavy scissors The specimen includes the party wall between the antrum and the nasal cavity The mucous membrane lining the antrum is removed and the ethmoid cells curetted.



434 Mobilization of the bone



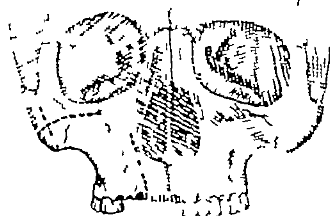
435 Further mobilization of the

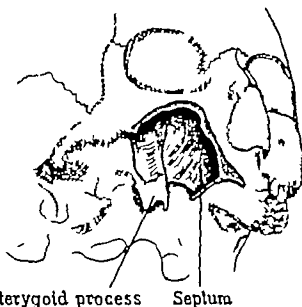


PARTIAL RESECTION OF THE MAXILLA FOR EARLY CANCER OF THE ANTRUM CONTINUED

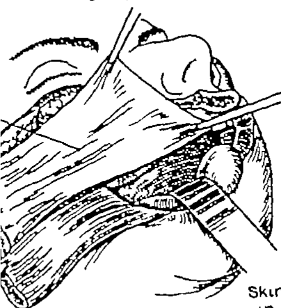
438 A split-skin graft is placed so as to completely cover all raw surfaces Its edges are sutured to mu cous membrane margins wherever possible

439 Following placement of the graft, the operative defect is packed to hold the skin graft in accurate firm approximation to the raw surfaces.

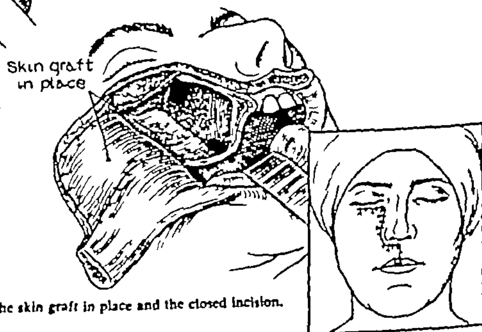




437 Diagrammatic representation of the lines of incision through bone and the result ing bony defect.



Skin grafting of the maxillary defect.



439 The skin graft in place and the closed incision.

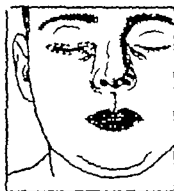
RADICAL RESECTION OF THE MAXILLA FOR ADVANCED CANCER OF THE ANTRUM AND PARANASAL SINUSES

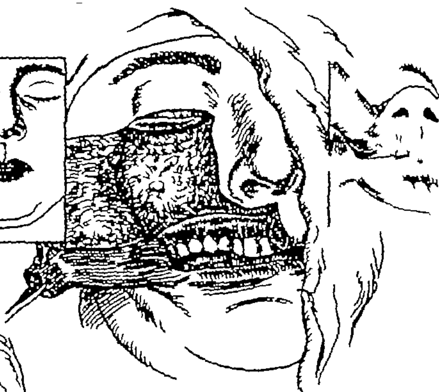
Radical resection of the maxilla necessitates exenteration of the orbit, including its bony floor and mesial wall When the growth definitely arises in or invades the ethmoid cells the mesial bony wall of the orbit should be resected. In certain cases the necessity for excision of the posterior and superior walls will also expose the dura. Occasionally the lateral margin of the resection also should include part of the zygoma and of the ramus of the mandible When the growth invades posteriorly the pterygoid process should be resected

The main basic distinction between partial and radical resection of the maxilla is that in the latter operation the eye is sacrificed It is prudent to obtain permission for removal of the eye in all cases scheduled for partial maxillectomy

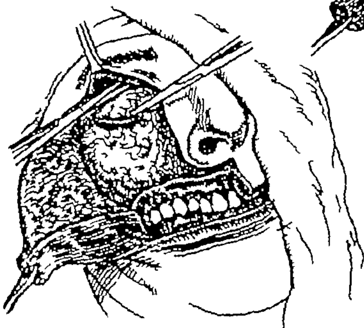
In the closure of the wound all raw surfaces should be covered by a split skin graft sutured to the skin and mucous membrane margins whenever possible *It is a grave error to make a complete closure of the orbital defect* Since the patient must wear some form of covering, the orbital opening should be left large rather than small to facilitate examination for recurrence of the growth If recurrence takes place, a large orbital defect will serve as a means of ready access for a cone or cylinder in giving radiation therapy

440 441 An extended Weber Fergusson incision is made to circumscribe the orbital fissure If the eye is to be sent to an eye bank, the palpebral fissure should be closed by stitches. The lateral cheek flap is mobilized backward to about the level of the zygoma





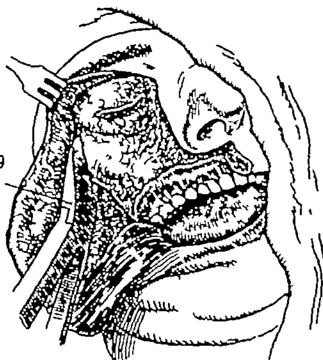
440 The *incision*



441 Beginning dissection to exenterate the orbit

RADICAL RESECTION OF THE MAXILLA FOR ADVANCED CANCER OF THE ANTRUM AND PARANASAL SINUSES CONTINUED

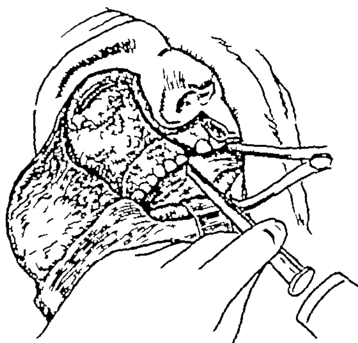
442 443 444 The malar zygomatic junction is severed with a bone-cutting forceps The anterior maxillary wall and the bony hard palate is cut through with a vibratory bone saw and mobilized further with a chisel.



442 Cutting the malar process.



443 Cutting the alveolar process.

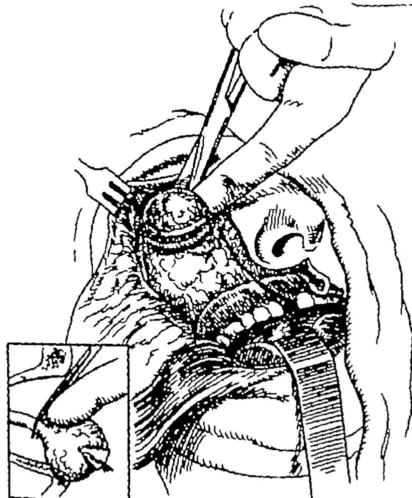


444 Mobilization with a chisel.

RADICAL RESECTION OF THE MAXILLA FOR ADVANCED CANCER OF THE ANTRUM AND PARANASAL SINUSES CONTINUED

445 Using scissors the globe is mobilized by sharp dissection. The eye itself should be sent to an eye bank for use in cornea grafting.

446 The surgical specimen is pried loose with the combined use of chisel and heavy scissors



445 Enucleation of orbit

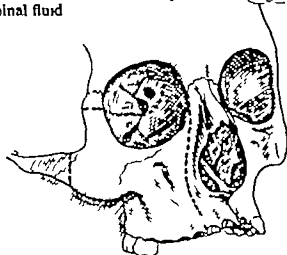


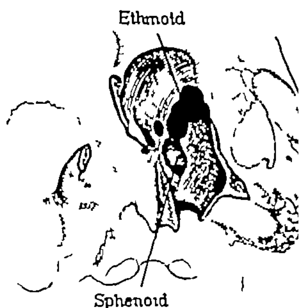
446 The completed resection.

RADICAL RESECTION OF THE MAXILLA FOR ADVANCED CANCER OF THE ANTRUM AND PARANASAL SINUSES CONTINUED

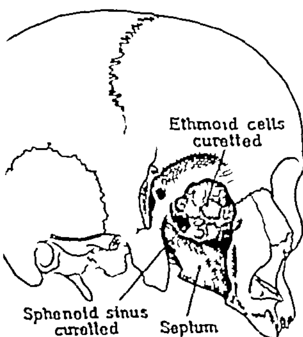
447 The entire maxilla has been resected along with the mesial wall of the orbit widely exposing the curetted ethmoid cells the sphenoid sinus has also been curetted. The cranial cavity has not been entered.

448 449 If there is evidence of deeper invasion of the ethmoid area the cribriform plate may be resected and the orbital wall resected to expose an area of dura 2–2 5 cm in diameter When the cribriform plate is curretted there will always be a leakage of cerebrospinal fluid

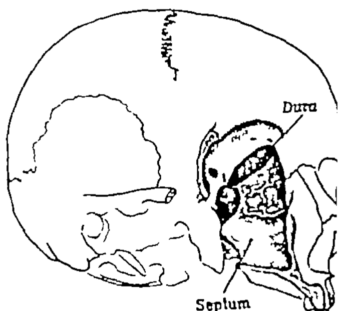




447 In this diagram a less radical exenteration of the ethmoids has been made.



8 The amount of bone removed in radical ection of the maxilla.

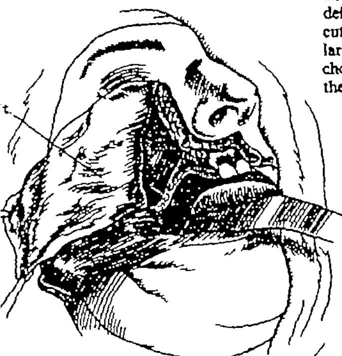


449 Exposure of the dura

RADICAL RESECTION OF THE MAXILLA FOR ADVANCED CANCER OF THE ANTRUM AND PARANASAL SINUSES CONTINUED

450 A split-skin graft should be sutured in place to cover as much as possible of the raw surfaces

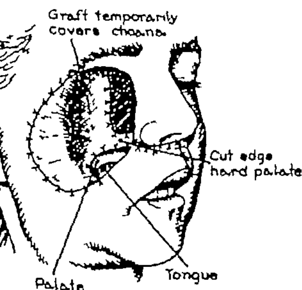
451–452 The lower eyelid should be folded inward and down to leave a large rather than a small orbital defect When there is invasion of the skin and subcutaneous tissues the orbital defect may be even larger The skin graft should cover temporarily the choanal opening and should extend forward to cover the cut edge of the hard palate if possible



50 Skin grafting of the maxillary defect.



451 Completion of the skin graft



452 Completed closure.

Chapter 20

OPERATIONS FOR PAROTID TUMORS

OPERATIONS FOR PAROTID TUMORS

In general, parotid tumors are best removed through a Y incision After exposure of the outer surface of the parotid, one should proceed at once with exposure of the main trunk of the 7th nerve posteriorly If the nerve is to be preserved such exposure is essential as a preliminary step Only in the case of small, superficial, peripheral tumors is the surgeon justified in making a simple incision and superficial enucleation of the tumor

When the main trunk or the upper (temporofacial) division of the 7th nerve has been sacrificed electively because of invasion by the growth it is advisable to fuse the eyelids of the corresponding side to prevent complications (epiphora, corneal ulceration, etc) resulting from paralytic ectropion (see Figs 119–121)

SOME CARDINAL PRINCIPLES OF TUMOR SURGERY OF THE PAROTID GLAND

1 Never assume that a centrally placed parotid tumor is entirely superficial simply because it seems so on palpation In some apparently fairly superficial and movable tumors the growth may be found to extend beneath the 7th nerve and its plexus

2 Always proceed first to expose directly the main trunk of the 7th nerve posteriorly except in small peripheral tumors (Fig. 453)

3 By means of careful dissection avoid if possible rupture of the tumor capsule and spillage of the tumor through the wound.

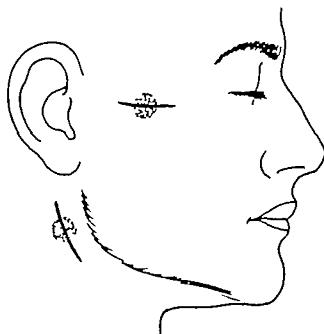
4 If spillage inadvertently occurs flush the wound at the close of the operation by pouring sterile saline solution (several liters) from a height of 2½ to 3 feet.

5 Apply a judicious amount of pressure in the dressing to prevent the accumulation of serum and saliva

EXCISION OF SMALL PERIPHERALLY PLACED PAROTID TUMORS

In rare instances small parotid tumors may be situated both superficially and in the periphery of the parotid gland When judiciously selected, such tumors may be removed through relatively short incisions. This form of limited incision should be used only for tumors so placed and for those 1 cm., or less, in diameter

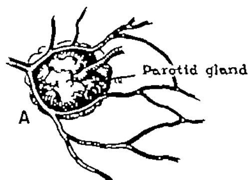
453 For small tumors situated peripherally anteriorly or inferiorly it is sometimes permissible to make a short incision carried down to the tumor which is then excised This form of limited incision should not be used except rarely for small tumors as above described

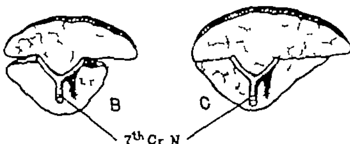


453 Excision of small peripherally-placed parotid tumors.

SURGICAL ANATOMY OF THE 7TH NERVE

A source of electric current to locate the nerve is superfluous to the expert surgeon who knows the surgical anatomy of the facial nerve within the parotid



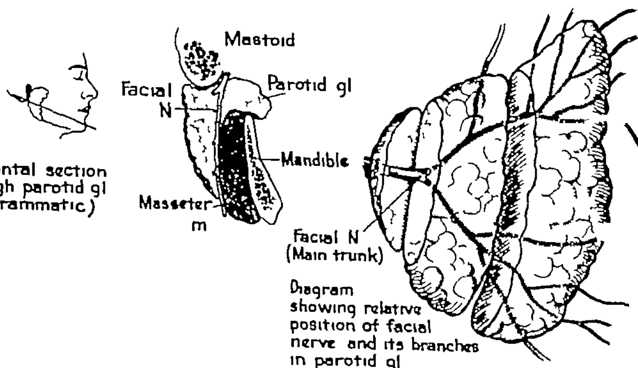


454 Embryologic anatomy of the parotid gland and the 7th nerve.

454 Embryologically the parotid gland arises in crotch, *A* of the 7th nerve where it first divides the temporofacial and cervicofacial divisions As gland develops it folds over the nerve *B* and ˆ these overlapped portions of the gland fuse *C* so the 7th nerve comes to lie *within the gland* for a siderable portion of its course.

455 If an obliquely horizontal section is through the parotid gland on the level of the exit the nerve from the masseter foramen the nerve w be found to traverse the midportion of the gland a finally come to lie beneath the gland on the of the masseter muscle

Approached posteriorly the first division of nerve into two main trunks will usually be 5–10 mm within the gland itself A wide in the remaining portion of the plexus will be in individual cases in regard to both the form of plexus and the anastomoses and the size and of individual branches In the central portion of ı parotid between the two main trunks no portions the plexus will be found There are anastomoses tween the upper and lower divisions of the n anteriorly

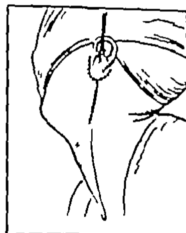


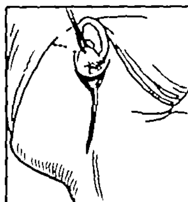
455 The surgical anatomy of the 7th nerve within the parotid gland.

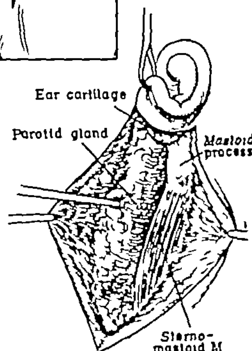
SUPERFICIAL PAROTIDECTOMY

456 A Y-shaped incision is made with the upper branches extending anterior and posterior to the ear the lower arm of the incision is slightly curved and extends downward into the neck An anterior extension along the lower border of the zygoma is optional. The skin flaps are dissected off the parotid anteriorly and off the mastoid process and sternomastoid muscle posteriorly The ear is reflected upward by sharp dissection.

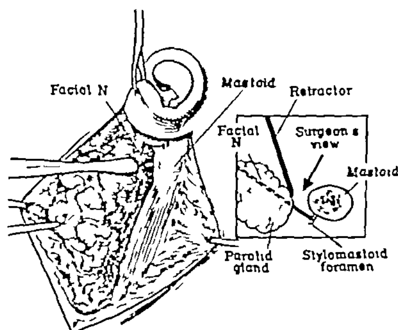
457 The main trunk of the facial nerve is exposed at a depth of about 1 5 cm from the external surface of the mastoid process by dissecting directly downward along the anterior border of the mastoid process above the attachment of the posterior belly of the digastric muscle The exposure is made by blunt dissection along the posterior capsule of the parotid pushing the gland anteriorly



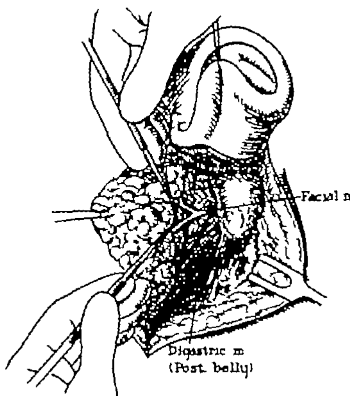




456 Position of the incision and raising of the skin flaps.



457 Exposure of the main trunk of the facial nerve.

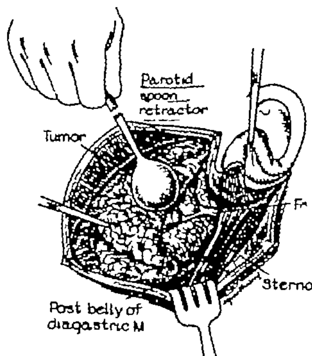


458 Exposure of the main branches of the nerve.

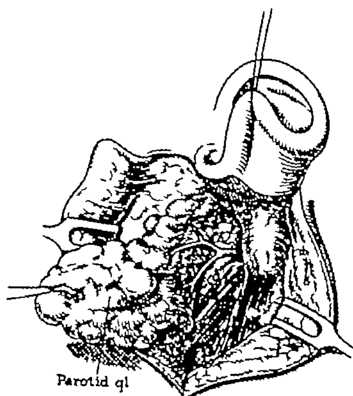
SUPERFICIAL PAROTIDECTOMY CONTINUED

458 As the dissection proceeds along the main 7 nerve the bifurcation is reached (temporofacial cervicofacial divisions) Occasionally the bifurcati of the nerve may occur before it enters the aspect of the parotid gland Here a nerve branch being isolated from the gland tissue by pointed sectors

459 460 Once the main trunk of the nerve ' been identified, the parotid gland may be and pushed forward by blunt dissection exposing preserving all branches of the nerve. It is of lar importance to identify and preserve the marginalis mandibulae (to the lower lip) A retractor is being used in Fig. 459



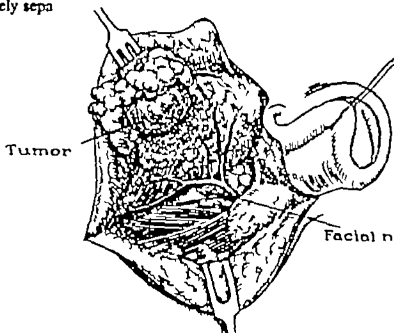
459 Exposure of the 7th nerve plexus and section of the parotid.



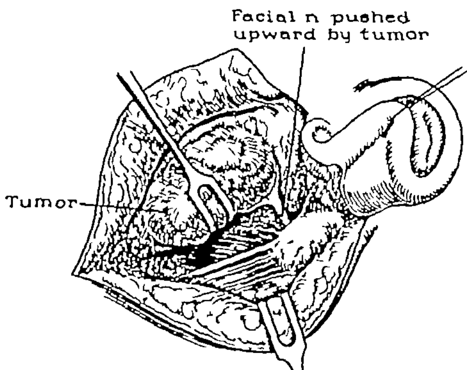
460 Exposure of the 7th nerve plexus and subtotal resection of the parotid.

SUPERFICIAL PAROTIDECTOMY CONTINUED

461 462 An encapsulated tumor of the tail of the parotid gland has pushed the main trunk and first di vision of the nerve upward The main subdivisions of the nerve surround the tumor but can be safely sepa rated from it



461 A sharply delimited tumor of the lower portion of the gland is being dissected off the nerve plexus.



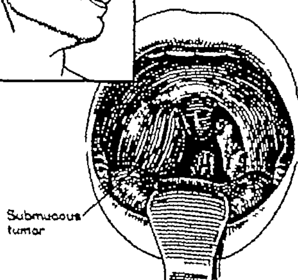
462 Variation in surgical anatomy of parotid tumors.

EXCISION OF RETROMANDIBULAR TUMORS OF THE PAROTID

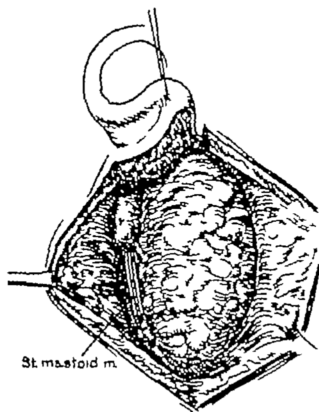
Most retromandibular tumors present externally, but occasionally they present mainly in the tonsillar area The greatest difficulty to their removal is preservation of the overlying 7th nerve.

463 464 465 Retromandibular tumors of the parotid commonly present as a bulge in the tonsillar region. The conventional Y-shaped incision is used the flaps are dissected back to expose the upper anterior border of the sternomastoid

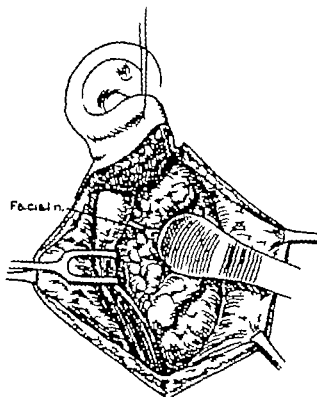




463 The intraoral appearance and the external incision



464 The superficial exposure.



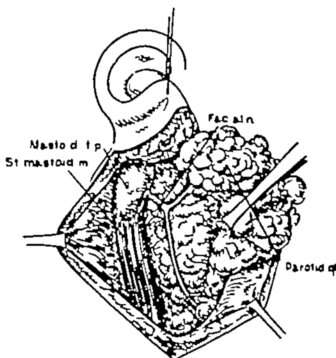
465 Exposure of the main trunk of the nerve.

EXCISION OF RETROMANDIBULAR TUMORS OF THE PAROTID CONTINUED

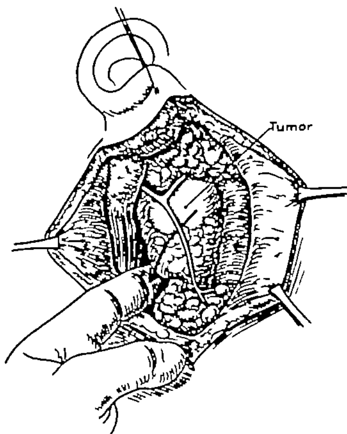
466 The main divisions of the nerve are exposed and the superficial portion of the parotid gland resected

467 Having removed the superficial portion of the parotid gland overlying the tumor the growth is mobilized by blunt dissection and manipulated to determine the most ready route of egress from its bed

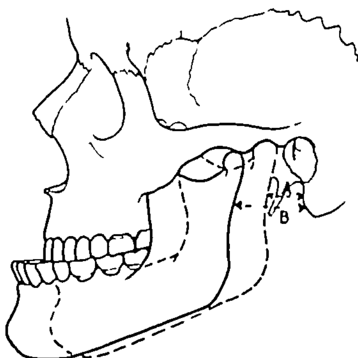
468 The mobilization of retromandibular parotid tumors is facilitated by sliding the mandible forward *A* thereby almost doubling the distance *B* between the mastoid process and the posterior edge of the ramus



466 Exposure of the nerve and partial resection of the parotid.



467 Mobilization of the tumor

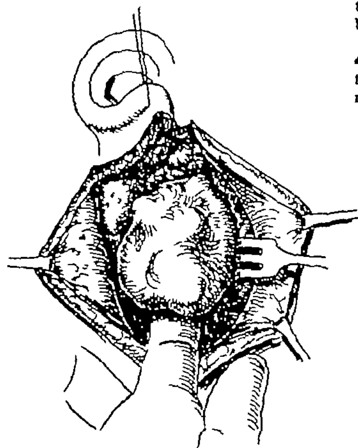


468 Prognathic displacement of the mandible to widen the parotid fossa.

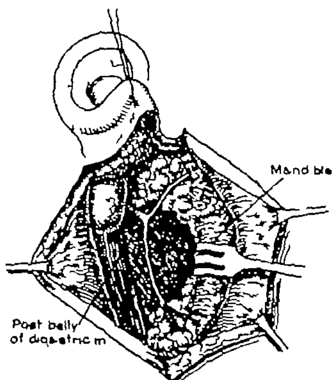
EXCISION OF RETROMANDIBULAR TUMORS OF THE PAROTID CONTINUED

469 Once an avenue of exit for the tumor has established, *the nerve branches are pushed tenorly so that the deeper portion of the tumor* be dissected free.

470 Note that the 7th nerve has been preserved that the peripheral portions of the parotid remain.



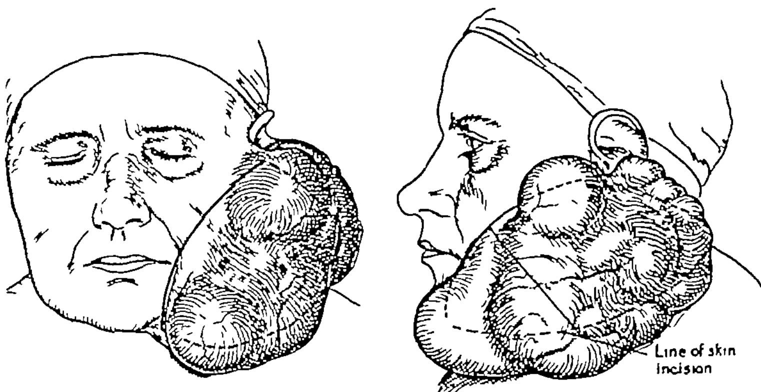
469 Further mobilization of the tumor



470 Appearance of the wound following removal of the tumor

EXCISION OF BULKY BENIGN PAROTID TUMORS

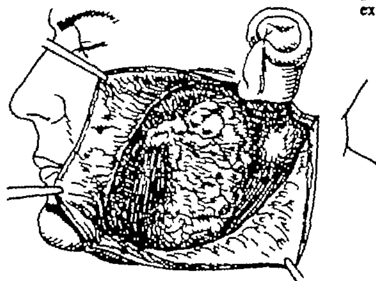
Untreated parotid tumors of long duration may become bulky sometimes being 15–20 cm in diameter The traction of their weight usually causes the tumor to extrude from the parotid gland itself As a result, the nerve is not pressed upon Unless the tumor has undergone malignant degeneration the outlook is excellent for complete excision without injury to the nerve and for permanent control. Frequently such bulky tumors lie so much outside the gland that they can be excised without exposure of the 7th nerve



471 The appearance of the tumor and the position of the incisions near the base of the tumor

EXCISION OF BULKY BENIGN PAROTID TUMORS CONTINUED

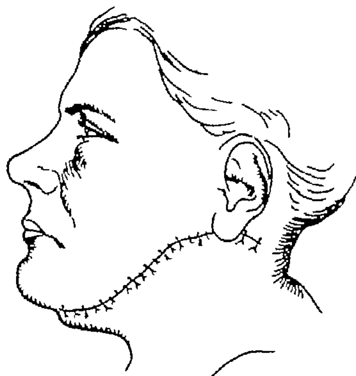
472 Note that the major portion of the parotik gland still remains and that there is no necessity fo exposure of the nerve



472 Appearance of the wound following excision of the tumor



473 Appearance of the surgical specime

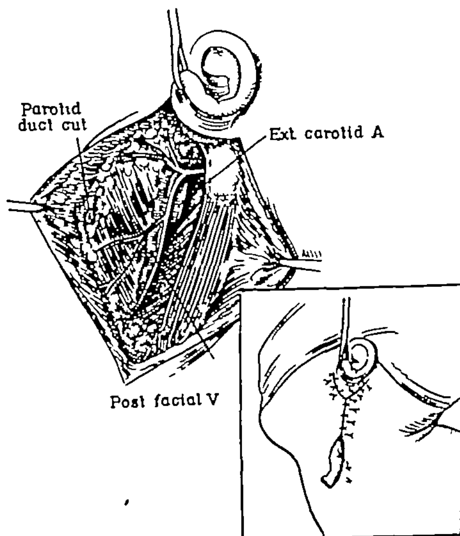


474 Closure of the wound.

SUBTOTAL PAROTIDECTOMY WITH PRESERVATION OF THE 7TH NERVE

Complete excision of the parotid (i e., a removal of every fragment of parotid tissue) is difficult for the reason that the gland has an indistinct capsule and that the borders of the gland (parotid tissue) are somewhat difficult to distinguish from subcutaneous fat The attempt to remove every particle of parotid tissue is probably seldom either necessary or advisable On the other hand, given sufficient time and patience practically all of the gland can be removed, with preservation of the whole nerve plexus. The operation may be performed either alone or combined with neck dissection. In cases of bulky infiltrating cancer of the parotid, any attempt to preserve the 7th nerve is inadvisable since it would result in spillage of the tumor cells and contamination of the entire wound

475 As much of the parotid gland as desired may be removed with the tumor *en bloc* Peripheral fragments of parotid tissue may be left behind without fear of postoperative salivary fistula formation

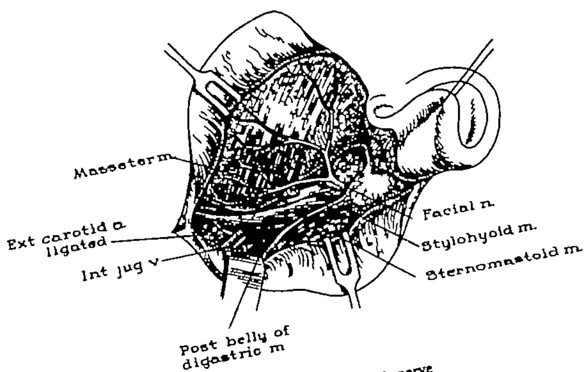


475 The appearance of the operative wound following subtotal resection

OPERATIONS FOR TUMORS OF THE PAROTID (Fig 476)

TOTAL PAROTIDECTOMY WITH PRESERVATION OF THE 7TH NERVE

476 If the parotid gland is to be removed, includin its retromandibular portion, there must be a piec meal dissection in order to preserve all the branch of the nerve. Should such operation be indicated f extensive cancer it is safer to sacrifice the who nerve

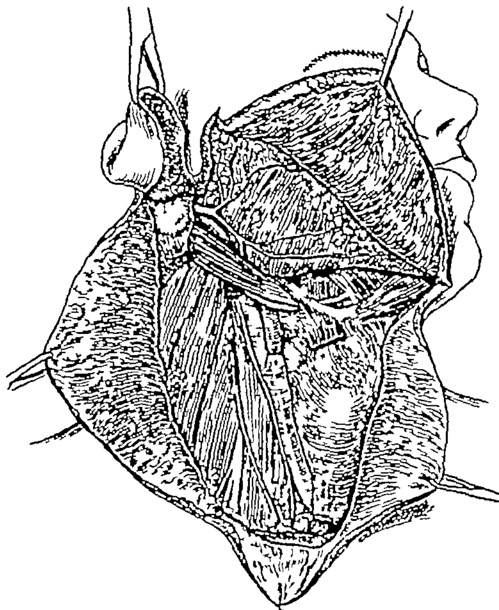


476 Preservation of the 7th nerve

SUBTOTAL PAROTIDECTOMY WITH PARTIAL PRESERVATION OF THE 7TH NERVE COMBINED WITH NECK DISSECTION

In occasional instances cancer of the parotid (with cervical metastases) may involve only the lower portion of the parotid and in these cases a neck dissection and subtotal parotidectomy justifiably may be combined

477 Note that the cervical branch of the 7th nerve has been sacrificed.

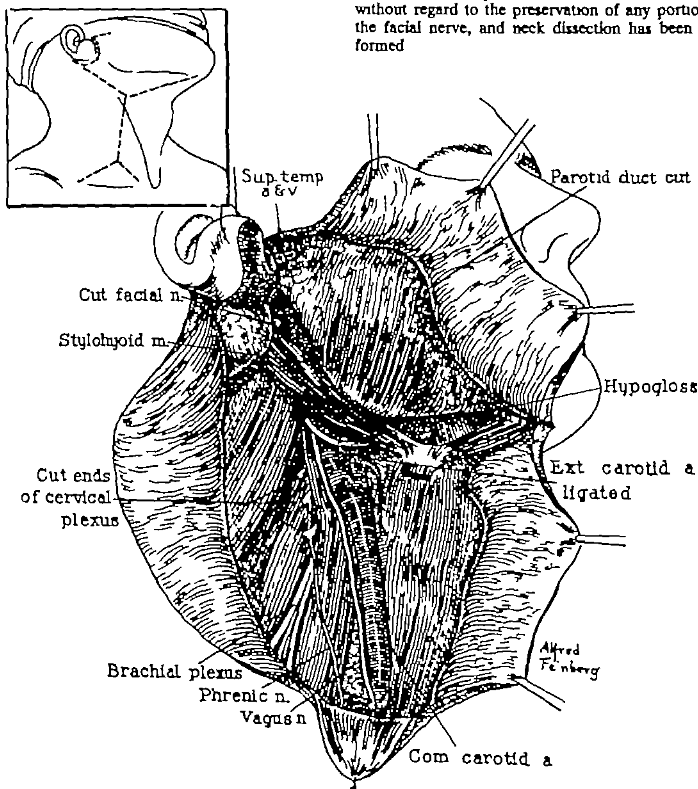


477 The appearance of the wound after the completed operation.

TOTAL PAROTIDECTOMY WITH COMPLETE SACRIFICE OF THE 7TH NERVE PLUS NECK DISSECTION

This radical operation is the safest for use in highly malignant metastasizing tumors of the parotid The complete sacrifice of the 7th nerve is an additional safety measure For neck dis section see Figs. 79–86

478 The whole parotid area has been cleared without regard to the preservation of any portion the facial nerve, and neck dissection has been formed



478 The appearance of the operative field at the end of the operation.

Chapter 21

OPERATIONS ON THE LARYNX

VARIATIONS IN FORM AND EXTENT OF LARYNGEAL SURGERY FOR CANCER

Surgery of the larynx for tumors (malignant or benign) may vary in extent from the conservative endoscopic removal up to the most radical pharyngolaryngectomy (or pharyngoglossolaryngectomy) combined with neck dissection. The field of such surgery for larynx cancer is broad and the possibilities many and the surgeon is not limited merely to a choice between one or other of these extremes

From the lay or patient standpoint (often shared by the physician) the question has perhaps been oversimplified in the past by the concept that laryngeal surgery for cancer is to be divided into two classes of operation. The first is one in which the normal airway through the nose and mouth is retained with a variable degree of normal voice (partial laryngectomy) The second class of operation is one in which the larynx is removed and the chief characteristic here is that the airway (trachea) is diverted in order to open on to the surface of the neck (total laryngectomy) While such a simple differentiation may suffice for the layman the head and neck surgeon should have a somewhat different perspective He needs to conceive that detaching the trachea from the larynx and implanting it to open on the surface of the neck does not always imply a necessity for the *total* removal of the larynx. As a matter of fact in some such cases following diversion of the airway considerable portions of uninvolved larynx (epiglottis aryepiglottic fold, ventricular band and vocal cord) can be retained safely to assist in the closure of large pharyngeal defects which would otherwise require the use of either pharyngeal skin grafts on stents or temporary pharyngostomes It is my purpose at this point to offer a practical classification of operations for laryngeal tumors and to stress the practical applications and advantages of what logically can be termed a *subtotal laryngectomy*

Endoscopic Removal of Laryngeal Tumors. Suspension laryngoscopy conceived and perfected by Killian and Lynch has been used in the past for what is termed "intralaryngeal surgery" for the removal of cancer of the vocal cords, or of the tip of the epiglottis With present day facilities however such intralaryngeal surgery hardly can be justified for malignant tumors in my opinion Endoscopic removal (Figs 22–24) is useful mainly for benign laryngeal polyps which in certain cases may be so extensive as to involve practically all of both cords, in which case the procedure known as *stripping of the cords* may be used Cord stripping is employed by some in pachydermia of the cords, but I believe that it is seldom justifiable and that it is much better to observe such cases until some particular area appears to be suspicious at which time only a small biopsy

specimen should be removed If the report is *that of cancer it is much safer to make a laryn* gofissure and partial laryngectomy of the in volved tissues

Partial Laryngectomy through Laryngofissure or through Infrahyoid Pharyngotomy The technics for these respective methods of approach to the larynx are shown in Figs 480–487 and 114–118 *The intrinsic larynx is best exposed through* laryngofissure the extrinsic by infrahyoid pharyngotomy The cases should be selected carefully so that this limited procedure is not used in situations too far advanced to be suitable

Total Laryngectomy This term should be used to describe only that operation in which the *whole larynx is removed—that is the epiglottis,* aryepiglottic folds the arytenoids the ventricular bands the vocal cords the subglottic mucosa and the thyroid and cricoid cartilages All the latter structures are specified as making up the organ called the larynx. If any of the above mentioned structures are not removed the operation properly should be termed either a *subtotal* laryngectomy or a *partial* laryngectomy

Subtotal Laryngectomy I can remember seeing 25 or 30 years ago many "total" laryngectomies in which the epiglottis had been left in place apparently for the purpose of facilitating closure I have also operated upon several such cases in which there was a recurrence of the growth in the epiglottis In the average case suitable for simple total laryngectomy closure is not particularly difficult and there is no advantage in preserving the epiglottis Until recent years most laryngeal surgeons considered that leaving the epiglottis behind in "total" laryngectomy was proof that the operator was either inexperienced or timid In our clinic this procedure is now considered proper in selected cases The epiglottis actually is part of the larynx and such operations should have been termed *subtotal* laryngectomies

In recent years surgery of the larynx has been extended and combined with radical neck dissection to encompass growths involving not only the larynx but extending on to the pharyngeal walls and/or downward into the post cricoid area In many cases of pharyngolaryngectomies resort has been made to skin grafting or to some form of semipermanent pharyngostome. *In other cases* although the primary closure was attempted there has been a high incidence of pharyngeal fistula In our clinic it has become obvious that considerable portions of uninvolved tissue of the larynx can be preserved (epiglottis aryepiglottic folds the arytenoids ventricular band, and vocal cords) *even after adequately wide excision of the* growth Such preserved portions of tissues of the larynx constitute a mucous membrane flap of sufficient size so that pharyngeal defects of almost any extent can be closed without resort to skin grafting or to leaving a pharyngostome.

In one technic the epiglottis and part of the aryepiglottic folds are preserved to assist in the repair of the ventral defect following the excision of the rest of the larynx for postcricoid lesions (Figs 532–539) Another example is to be found in definitely one sided growths involving the pyriform sinus and adjacent pharyngeal wall (Figs 540–548) In the latter case the soft tissues of the uninvolved larynx (stripped of thyroid cartilage) are preserved as a flap As a matter of fact, in some cases the flap may prove to be redundant and will require trimming for closure of even the most extensive defect The latter procedures obviously should not be classed as "partial" laryngectomies, since in many cases from one third to one half of the larynx is preserved Furthermore the procedures hardly can be termed "total" laryngectomies In my opinion *subtotal* laryngectomy is a proper designation

PARTIAL LARYNGECTOMY

An operation in which a part rather than the whole of the larynx is removed should be termed "partial laryngectomy" Such partial removal of the larynx may be made through endoscopy (seldom justifiable) through laryngofissure *or through anterior pharyngotomy* The terms "laryngofissure" or "thyrotomy" should not be used as being synonymous for partial laryngectomy

Partial laryngectomy is indicated for either benign or malignant growths, usually of a vocal cord but (through infrahyoid pharyngotomy) also *for small growths of the tip of the epiglottis and less often of the aryepiglottic fold*

Since a temporary tracheostomy is part of the routine, preliminary tracheal intubation should be avoided The first stages of the operation should be performed under local anesthesia until the isthmus and the thyroid have been severed and the tracheostomy tube inserted As soon as the latter airway is in place, general anesthesia is instituted and continued for the rest of the operation

Postoperatively until the patient recovers consciousness, a watch should be maintained for any evidence of undue bleeding or seepage down into the bronchial tube The tracheostomy tube should be suctioned every few minutes if necessary When the patient awakes the tube may be corked if the patient appears to have adequate airway It is advantageous to remove the tracheostomy tube the day following operation if there are no complications. Subcutaneous emphysema may occur but need cause no undue alarm.

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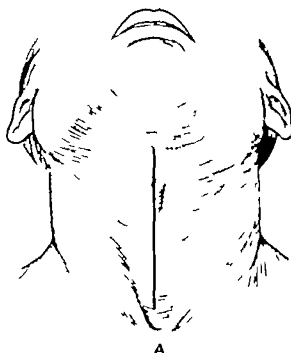
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ARTIAL LARYNGECTOMY THROUGH ARYNGOFISSURE

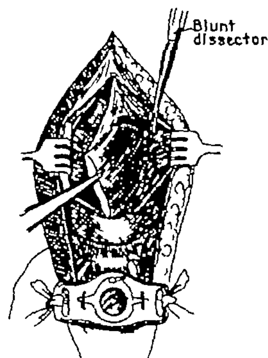
79 *A* An incision is made in the midline extend ig from the hyoid bone to the suprasternal notch ? The soft tissues are divided in the midline expos ig the thyroid and cricoid cartilages and the upper ortion of the trachea. The isthmus of the thyroid land is divided between ligatures A tracheostomy ibe is inserted. The thyroid cartilage is divided in ie midline with a motor saw care being taken that ie laryngeal cavity is not entered *C* The laryngeal avity is opened by the scissors the lower blunt pped blade of which is inserted through a stab ound in the cricothyroid membrane care being iken that the cut is made directly in the anterior ommissure

80 The edges of the wound are held apart by a elf retaining retractor and a cotton tampon attached o a string is inserted into the trachea above the acheostomy tube to prevent blood from entering ie trachea and bronchi An alternate method for reventing seepage of blood into the trachea is the se of an inflatable balloon over the tracheostomy ibe (see Figs 38 39)



479 The preliminary incision.

480 Exposure of the interior of the larynx

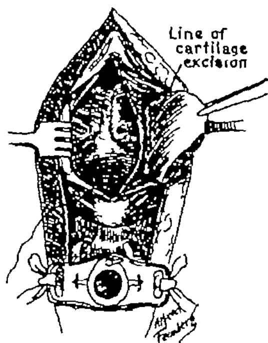


481 *Excision of thyroid cartilage.*

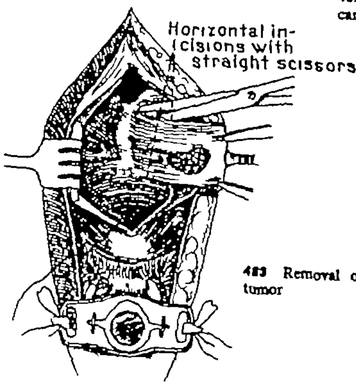
PARTIAL LARYNGECTOMY THROUGH LARYNGOFISSURE CONTINUED

481 482 Before excising the tumor itself a *maj* portion of one thyroid ala is removed by blunt su perichondrial dissection. The outer surface of th cartilage is exposed to within 1 cm of its posteri border The inner surface is similarly exposed. Th *major portion of the cartilage is then excised with th* scissors.

483 Two horizontal incisions are made with straig scissors, extending well back beyond the posteri limit of the tumor



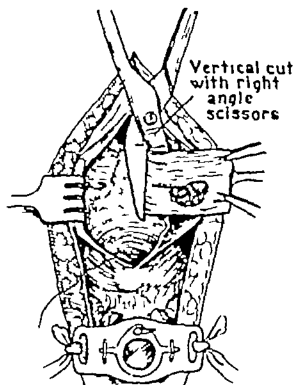
482 Mobilization of the inner surface of the thyroid cartilage.



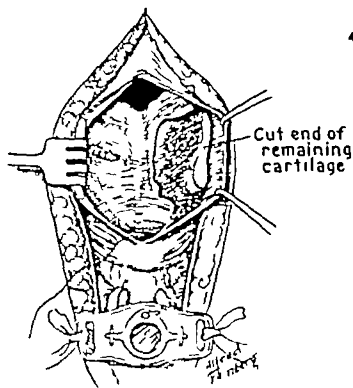
483 Removal of soft parts and tumor

PARTIAL LARYNGECTOMY THROUGH LARYNGOFISSURE CONTINUED

484 485 The excision of the block of soft tissue is completed with a vertical cut with a right angle scissors



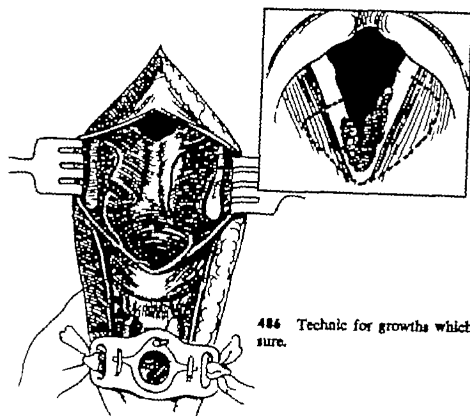
484 Excision of soft parts.



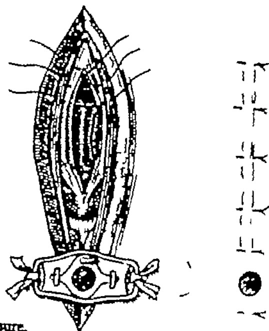
485 Appearance of the wound following removal of the soft parts and tumor

PARTIAL LARYNGECTOMY THROUGH LARYNGOFISSURE CONTINUED

486 487 In the occasional case of growths crossing the anterior commissure a major portion of one cord and a lesser portion of the opposite cord may be resected In such cases the airway at the level of the glottis will be narrower and it may be necessary to wear a tracheostomy tube permanently Such a procedure is not often indicated and is risky from the standpoint of inadequate removal In most cases total laryngectomy is to be preferred for lesions which have crossed the anterior commissure



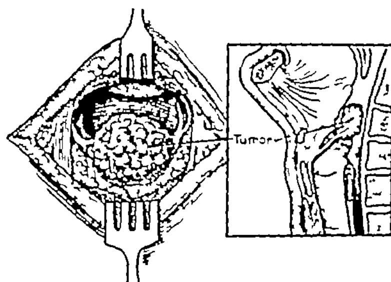
486 Technic for growths which extend beyond the anterior commissure.



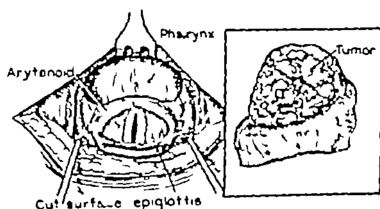
487 Closure of the wound in laryngofissure.

PARTIAL LARYNGECTOMY THROUGH ANTERIOR PHARYNGOTOMY (For initial stages of anterior pharyngotomy see Figs 114–118)

488 489 This procedure may be used for small or moderate-sized growths of the tip of the epiglottis It is not suitable for growths extending downward on the posterior surface of the epiglottis towards the anterior commissure



488 The appearance of the tumor after surgical exposure.

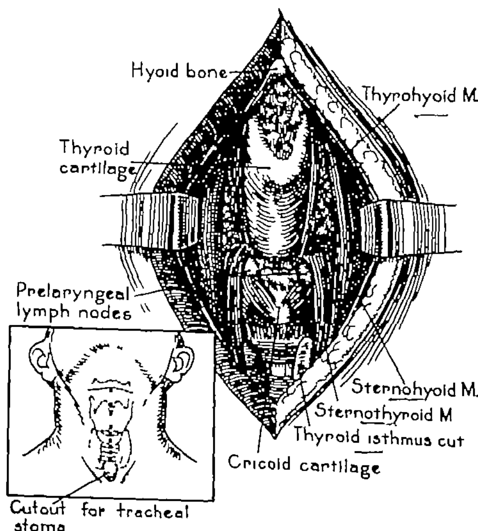


489 The appearance of the surgical field after amputation of the tip of the epiglottis.

TOTAL LARYNGECTOMY

When the whole larynx is to be removed there is little objection to preliminary naso-tracheal intubation and general anesthesia from the beginning of the operation Should the growth of the larynx be bulky or highly vascular, there may be marked contraindications to preliminary intubation and therefore the operation had best be started under local anesthesia and so continue until the tracheostomy tube, with a balloon cuff (Figs 38 39) is in place Preliminary tracheostomy is also somewhat objectionable in that the trachea is longitudinally slit. This disadvantage is somewhat overcome by making the opening into the trachea high next to the cricoid or even through the crico-thyroid membrane thereby avoiding undue trauma to the trachea and facilitating the formation of an adequate tracheal stoma

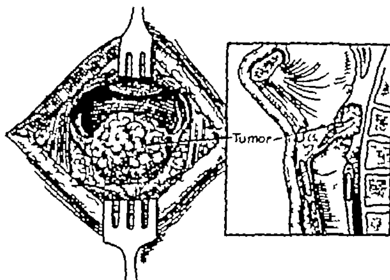
490 A midline incision is made from the level of the hyoid bone to below the level of the cricoid cartilage, severing the isthmus of the thyroid The sternohyoid muscles are retracted laterally



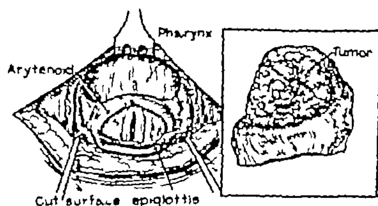
490 Operative Incision

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488 The appearance of the tumor after surgical exposure

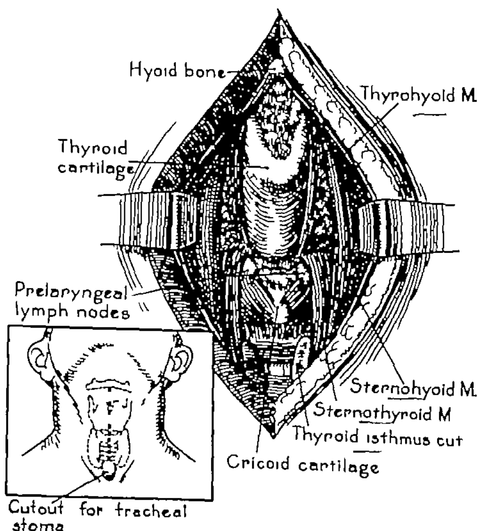


489 The appearance of the surgical field after amputation of the tip of the epiglottis.

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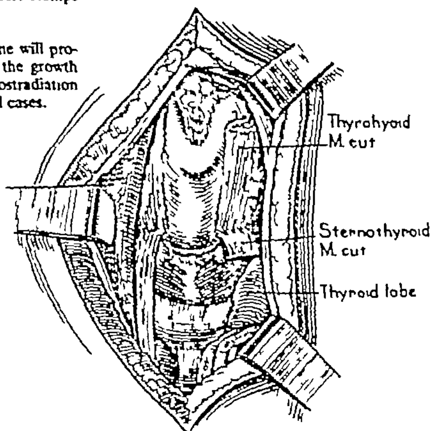


490 Operative incision

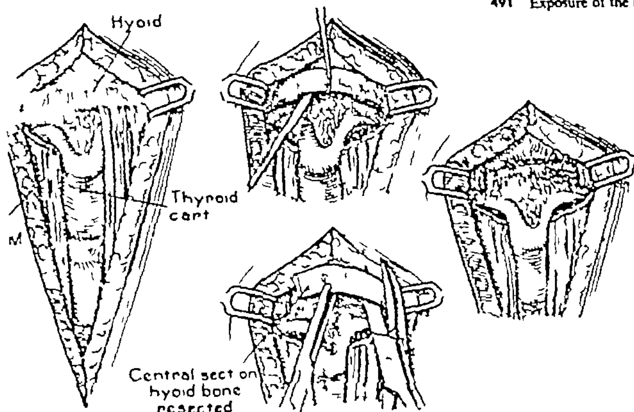
TOTAL LARYNGECTOMY CONTINUED

491 The thyrohyoid and sternothyroid muscles are severed at the levels shown, and the muscle stumps are left attached to the larynx.

492 Removal of a segment of hyoid bone will provide a wider exposure especially where the growth is extensive in the extrinsic larynx or in postradiation cases. The procedure is not essential in all cases.



491 Exposure of the larynx.



492 Partial removal of hyoid bone (optional)

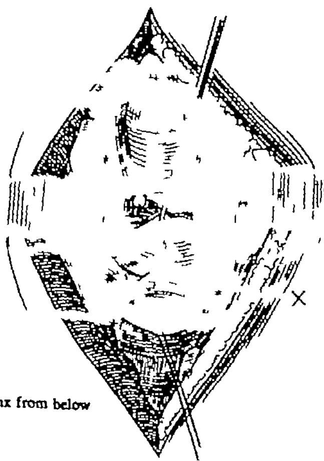
TOTAL LARYNGECTOMY CONTINUED

493 Rotation and retraction of the larynx are facilitated by severing the fibrous portions of the thyrohyoid membrane The posterior edges of the thyroid alae are mobilized by cutting the attachments of the inferior constrictor The superior cornua of the thyroid cartilage are severed near their tips The superior laryngeal artery and nerve are identified in the thyrohyoid membrane and both are ligated and cut

494 The trachea is cut across just above its upper ring (sometimes lower when there is subglottic extension) On the posterior wall *X* a slightly longer tongue of mucous membrane is taken.

Part of thyrohyoid membrane cut
Sup laryngeal A and N cut
Thyroid cornu cut
Inf constrictor M cut

493 Mobilization of the larynx.



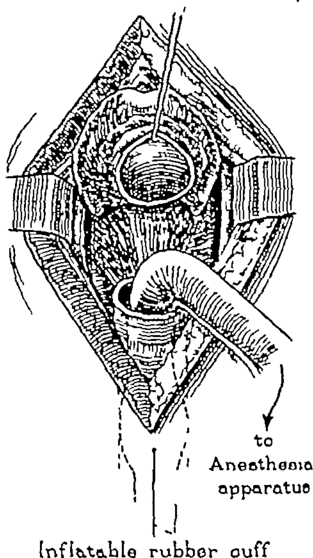
494 Opening of the larynx from below

TOTAL LARYNGECTOMY CONTINUED

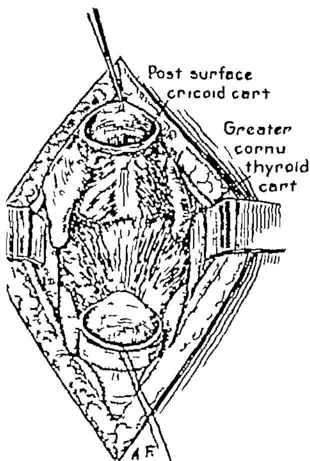
495 A flexible breathing tube with an inflatable cuff is inserted down into the open end of the trachea to prevent aspiration of blood The posterior wall of the larynx is mobilized by dissecting the esophagus and the attachments of the constrictor muscle from the posterior aspect of the cricoid cartilage

496 In this and the succeeding stages up to the time of the attachment of the trachea to the skin, the breathing cannula remains in the trachea It is omitted from the drawings for purposes of clarity The dissection is carried up as far as the arytenoids but the pharynx is not opened first at this point

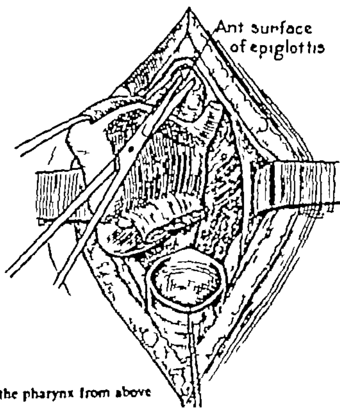
497 The larynx after being separated from the trachea and mobilized from below has been dropped back into place The anterior surface of the cartilage of the epiglottis is exposed by sharp dissection and carried deeply and upward through the thyrohyoid membrane until the pharynx is entered near the tip of the epiglottis



495 *Insertion of breathing cannula with an inflatable rubber cuff and mobilization of the larynx posteriorly*



Further mobilization of the larynx



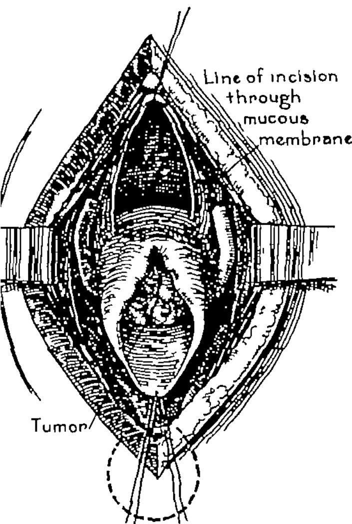
497 Opening into the pharynx from above

TOTAL LARYNGECTOMY CONTINUED

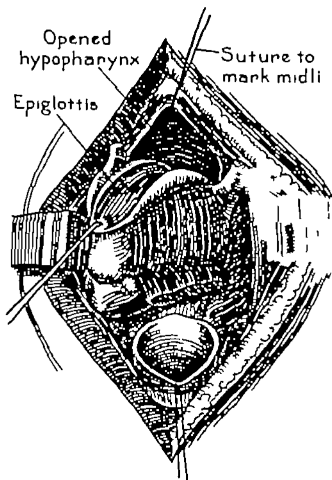
498 The tip of the epiglottis is grasped and pulled forward, and cuts are made with scissors downward along the aryepiglottic folds toward the arytenoids

499 Further traction on the epiglottis brings the arytenoids into view and the removal of the larynx is completed by a transverse incision through the mucous membrane just below the arytenoids

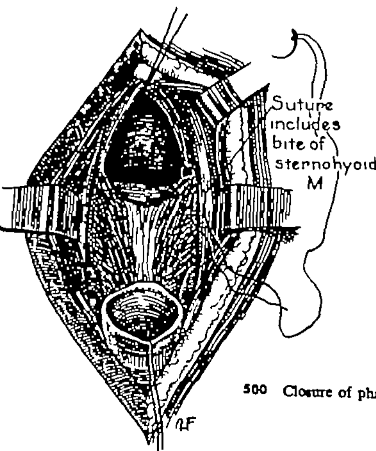
500 A running, interlocking, fine chromic catgut suture is begun at the lateral lower aspect of the pharyngeal opening and each suture includes a bite of the undersurface of the sternohyoid muscle It is important that the first sutures be fixed well posteriorly on the undersurface of the sternohyoid muscle



498 Mobilization of the larynx from above.



499 Removal of the larynx.

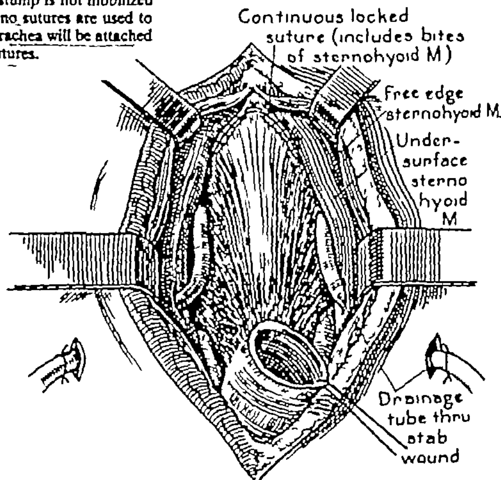


500 Closure of pharyngeal opening

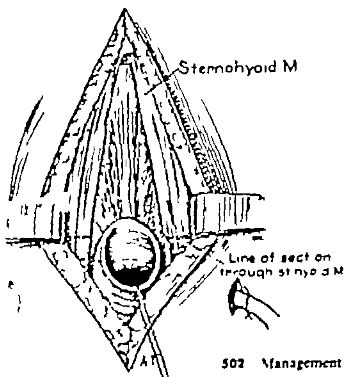
TOTAL LARYNGECTOMY CONTINUED

501 One continuous suture is used for each side of the closure to meet in the midline above Stab wounds are made laterally through the skin and sternohyoid muscle and rubber drainage tubes (size 16-F) are inserted into the upper angles of the deep space

502 The end of the tracheal stump is not mobilized from the esophageal wall and no sutures are used to fix it to the muscles Later the trachea will be attached only to the skin by multiple sutures.



501 Closure of pharyngeal opening completed.

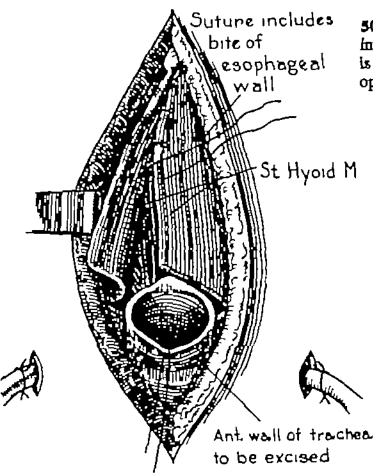


502 Management of the tracheal stump

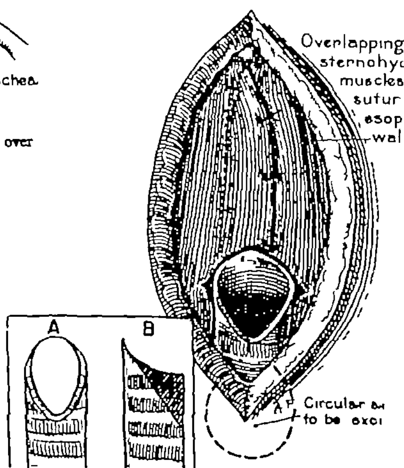
TOTAL LARYNGECTOMY CONTINUED

503 The free edge of one sternohyoid muscle is fixed to the undersurface of the opposite muscle by interrupted sutures Each suture includes a bite of the esophageal wall To avoid constriction of the tracheal stoma by the overlapped sternohyoid muscles, the latter are sectioned transversely just opposite the tracheal stoma.

504 The opposite muscle is overlapped and fixed by interrupted sutures The anterior wall of the trachea is excised on a bevel *A* and *B* to enlarge the tracheal opening.



503 Reinforcement of the pharyngeal closure by over lapping sternohyoid muscles.

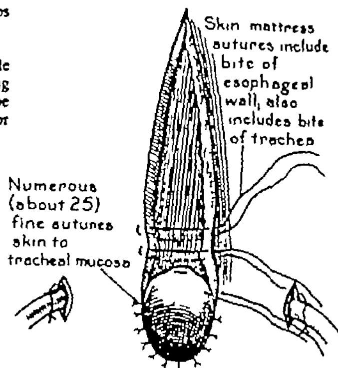


504 Reinforcement of the pharyngeal closure by ov hyoid muscles.

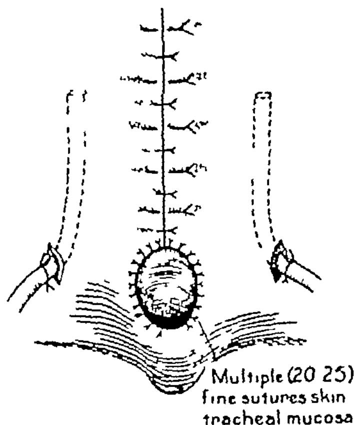
TOTAL LARYNGECTOMY CONTINUED

505 The tracheal stump is fixed to the skin edge by multiple (20–25) fine sutures At the upper margin of the tracheal stump mattress sutures are used to obliterate the dead space and to bring the skin flaps directly down to the esophageal wall

506 When the wound is closed there should be little or no narrowing of the lumen of the trachea Healing is promoted however if a large laryngectomy tube (#12) is worn part of the time for the first six or seven days



505 Fixation of the tracheal stump to the skin.



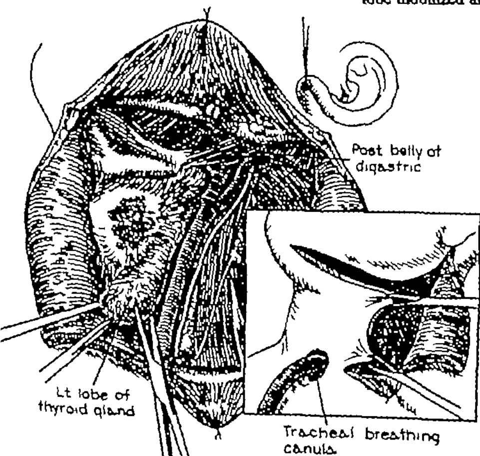
504 Skin sutures complete

TOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION

In cases of cancer of the extrinsic larynx where there is clinical evidence of cervical metastases radical neck dissection obviously should be combined with total laryngectomy In any event, the lesions are usually at least moderately advanced, and even though there is no palpable evidence of cervical metastases an ipsolateral neck dissection is advisable since during laryngectomy the neck must be opened in any case As a matter of fact, the associated neck dissection facilitates closure of the pharynx in difficult cases If bilateral metastases are palpable consideration should be given to bilateral neck dissection combined with total laryngectomy in one stage

After the excision of extensive growths of the pharyngolarynx there may be associated factors which make the repair either by primary closure or by skin graft of doubtful expediency After bringing the esophagus out to form an esophagostome below, there are two alternatives *1* to leave the pharyngostome above, which carries the disadvantage of profuse salivary leakage or *2* to close the pharyngostome above, in which case the accumulated saliva must be spit out. In such cases it is sometimes of benefit to ligate the parotid ducts (Fig. 113) to reduce the quantity of saliva After several months of freedom from disease, one may elect to build a new channel from the pharynx to the esophagus, preferably by the use of pedicle tube flaps similar to the technic shown in Figs 561–564 At that time the pharynx is entered quite readily through the thin wall of the previous repair

507 A radical neck dissection has been completed and a breathing tube with an inflatable balloon cuff has been inserted through a circular opening in the skin later to be used for the tracheal stoma The isthmus of the thyroid is sectioned and the thyroid lobe mobilized and resected

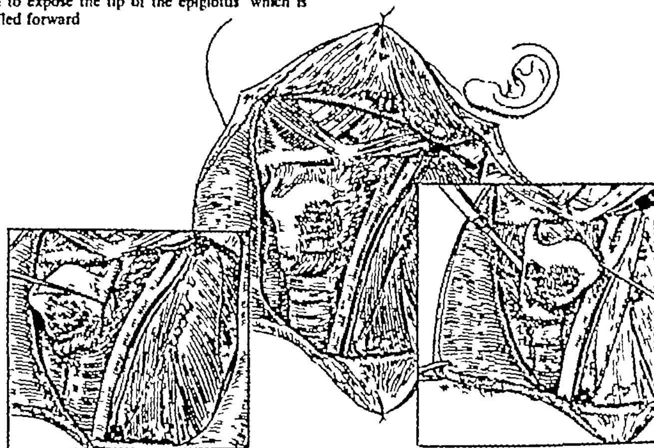


507 Preliminary mobilization of thyroid gland.

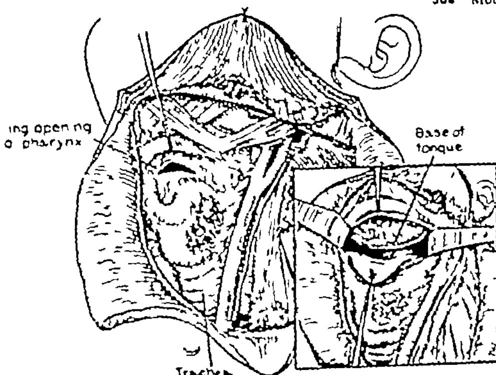
TOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION CONTINUED

508 The larynx is mobilized by section of the constrictor muscles at their attachment to the posterior border of the thyroid cartilage on both sides

509 The larynx having been mobilized, an opening is made into the pharynx *A* by an incision into the cricoid thyroid membrane *B* The opening is widened to expose the tip of the epiglottis which is then pulled forward



508 Mobilization of the larynx.

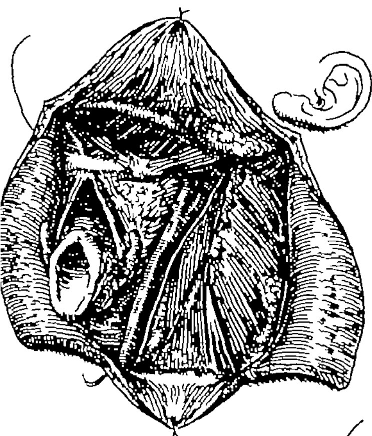


509 Opening into the pharynx

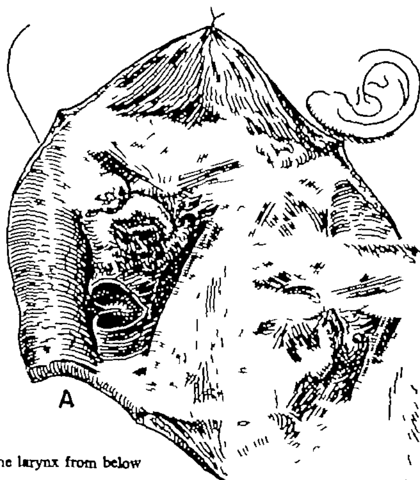
TOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION CONTINUED

510 Under direct vision the opening through the cricoid membrane is widened, following the aryepiglottic folds, care is taken not to cut too close to the growth which may be in the extrinsic larynx.

511 The larynx is retracted upward and the trachea cut across below the cricoid cartilage *A* A balloon-tip breathing tube reinserted into the end of the trachea and the larynx is then mobilized by cutting the posterior attachments to the constrictor muscles separating it from the pharyngeal wall *B*



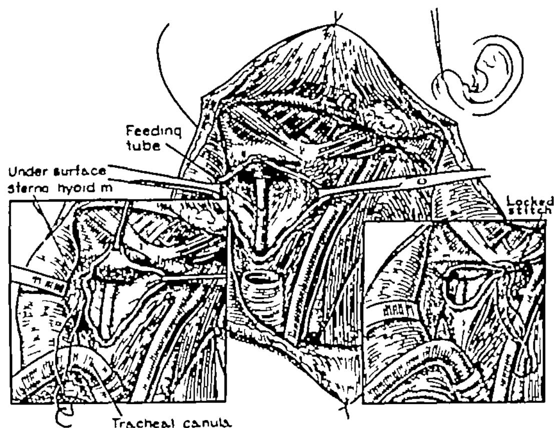
510 Further mobilization of the larynx.



511 Mobilization of the larynx from below

TOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION CONTINUED

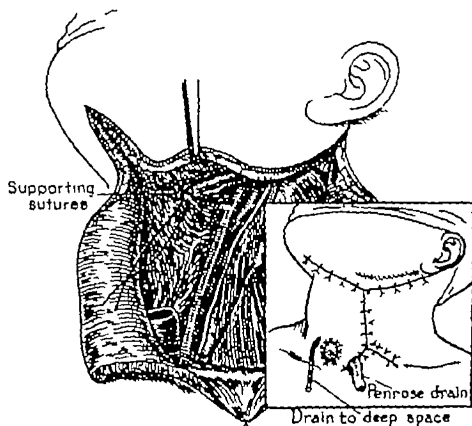
512 A nasal feeding tube is inserted through the nose and directed into the upper end of the esophagus. The pharyngeal opening is closed transversely each stitch including not only the mucosal edges but also some adjacent tissue (infrahyoid muscle, subcutaneous fat, digastric muscle)



512 Beginning closure of the pharyngeal opening

TOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION CONTINUED

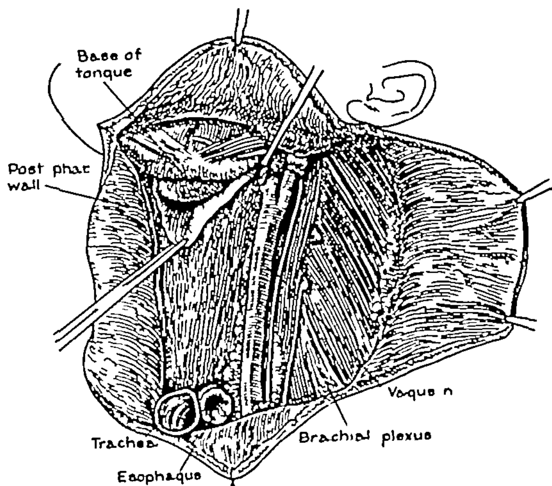
513 The pharyngeal mucosal closure is reinforced by one or more layers of supporting interrupted sutures, attaching the skin flaps firmly down to the line of pharyngeal closure After bevelling the end of the trachea obliquely, its edges are sutured to the skin, forming an oval stoma A deep tube drain has been inserted into the wound pocket on the opposite side of the neck and a Penrose drain on the side of the neck dissection.



513 Completion of pharyngeal closure.

VARIATIONS IN MANAGEMENT OF WIDE PHARYNGOSTOME FOLLOWING PHARYNGOLARYNGECTOMY

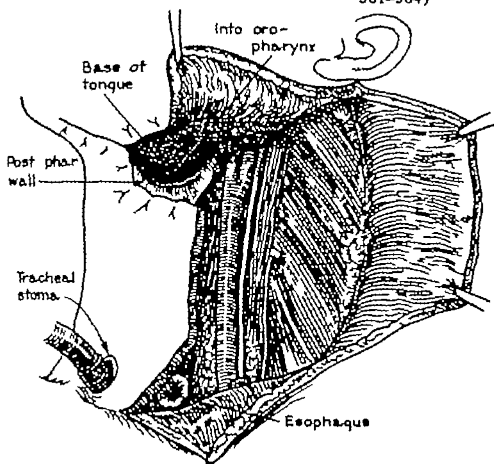
514 When an annular excision of the pharynx has been made it sometimes may be impractical either to make an annular suture or to place a skin graft on a stent



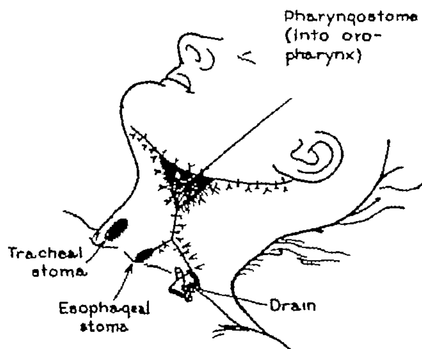
514 The appearance of the wound following extensive pharyngolaryngectomy

VARIATIONS IN MANAGEMENT OF WIDE PHARYNGOSTOME FOLLOWING PHARYNGOLARYNGECTOMY CONTINUED

515 516 One method of management is to leave a pharyngostome above and an esophagostome below (with a separate tracheal stoma) the intention being to effect later closure by pedicle tube flaps (see Figs 561–564)



515 Closure of the wound.

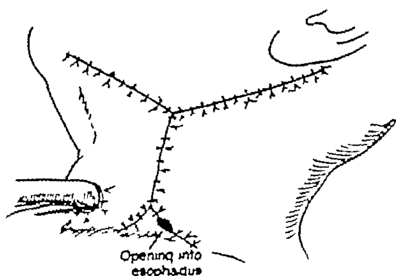


516 Semipermanent pharyngostome.

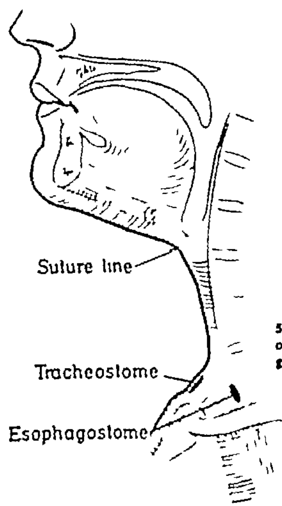
VARIATIONS IN MANAGEMENT OF WIDE PHARYNGOSTOME FOLLOWING PHARYNGOLARYNGECTOMY CONTINUED

517 An alternate method of management is to close the pharynx entirely above leaving an esophagostome below with the intention of making an opening into the pharynx above later should it be considered practical to reëstablish the pharyngoesophageal tract

518 In such cases it is usually advisable to make a ligation of the parotid ducts (see Fig 113) to reduce the volume of salivary secretions



517 The closed wound.

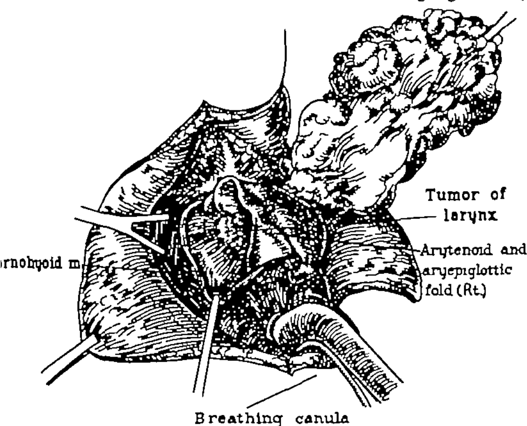


518 Diagrammatic representation of the closure of the pharynx above separate from the esophagostome below

PHARYNGOLARYNGECTOMY COMBINED WITH NECK DISSECTION

519A When the growth spills over onto the lateral pharyngeal wall, more mucosa must be excised

519B With the wider excision of the tissues and only a narrow strip of the posterior pharyngeal wall remaining, closure still may be effected by application of the foregoing technic (Figs 514–518)



519A Excision of a portion of the pharyngeal wall

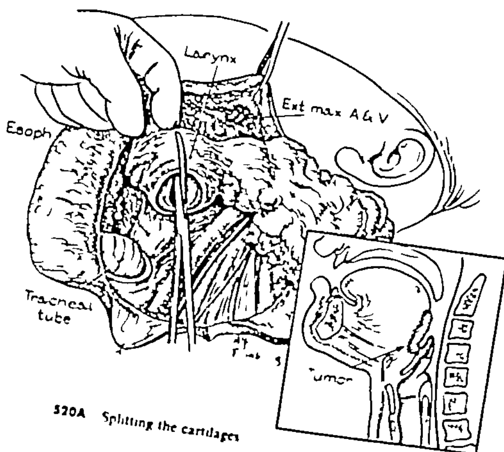


519B Closure of the pharyngeal opening.

MANEUVER TO OBTAIN DIRECT EXPOSURE AND VISUALIZATION OF THE VALLECULA AND OF THE BASE OF THE TONGUE IN TOTAL LARYNGECTOMY

While the most convenient approach to the pharyngeal cavity during total laryngectomy is through the cricothyroid membrane an alternative method that is useful for lesions involving the vallecula and base of the tongue is made from below through the postcricoid area at about the level of the arytenoids In order to enter the pharynx at the postarytenoid level it is convenient to insert a finger through the cricoid from below and tilt the larynx upward then making an incision over the tip of the palpating finger The caliber of the cricoid ring is too narrow to permit insertion of the finger unless the cartilages are first split anteriorly (laryngofissure) After the pharynx has been opened below further incision of the mucosa can be carried out laterally and the base of the tongue brought into view so as to select a safely wide margin beyond the tumor in the base of the tongue and/or its lateral pharyngeal walls

520A A neck dissection has been completed and the specimen left attached to the larynx The trachea has been detached from the cricoid cartilage and a breathing tube has been inserted In order to widen the laryngeal aperture so as to permit insertion of the finger the cartilages are split anteriorly in the midline The insert shows the site and extent of the primary lesion in a typical case

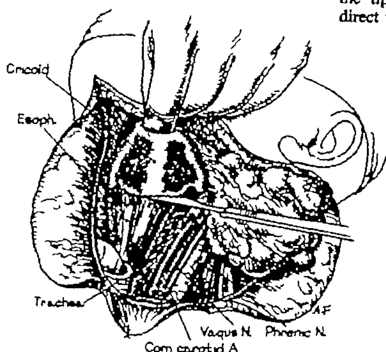


520A Splitting the cartilages

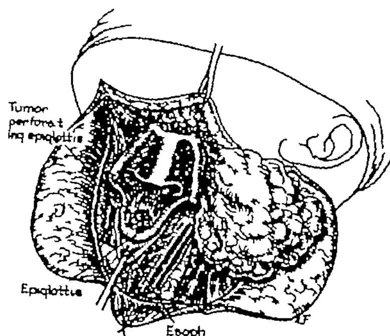
MANEUVER TO OBTAIN DIRECT EXPOSURE AND VISUALIZATION OF THE VALLECULA AND OF THE BASE OF THE TONGUE IN TOTAL LARYNGECTOMY CONTINUED

520B With the cartilages split, the finger is inserted upward into the laryngeal box and the larynx tilted upward and forward An incision then is made horizontally at the level of the arytenoids to open into the pharynx.

520C Continuing the incision into the mucosa under direct vision the larynx can be tilted 180° bringing the tip of the epiglottis pointing downward into direct view



520B Opening the pharynx.

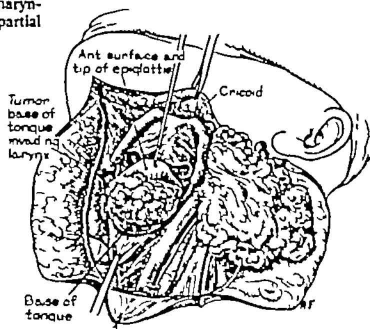


520C Delivery of the epiglottis into view

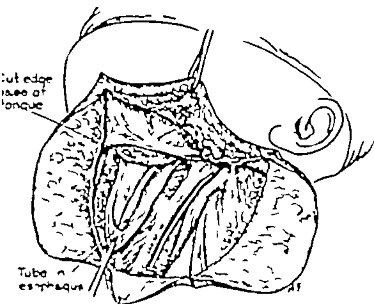
MANEUVER TO OBTAIN DIRECT EXPOSURE AND VISUALIZATION OF THE VALLECULA AND OF THE BASE OF THE TONGUE IN TOTAL LARYNGECTOMY CONTINUED

520D Grasping the tip of the epiglottis and pulling it upward the tumor of the vallecula as well as the base of the tongue is brought into direct view

520E By such an exposure an incision across the base of the tongue (or in the lateral pharyngeal walls) can be made under direct vision and as much of the tongue as is necessary can be resected The pharyngeal closure is not too difficult provided that a partial resection of the hyoid bone has been made.



520D Exposure of the base of the tongue

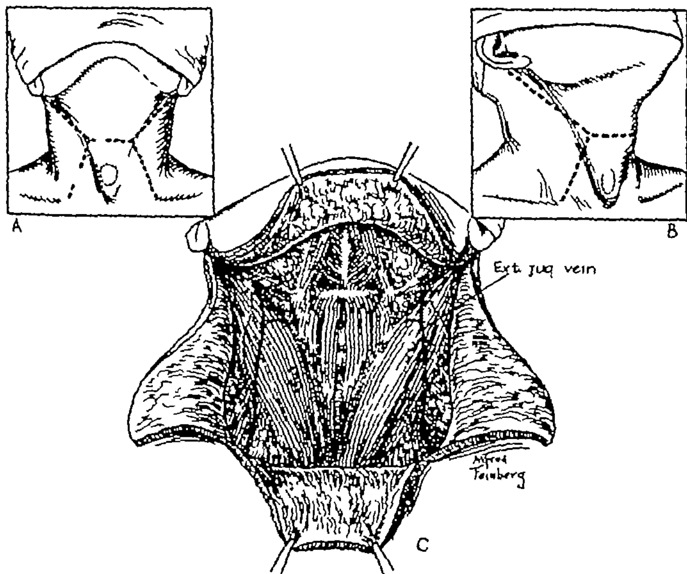


520E The resection completed.

TOTAL LARYNGECTOMY WITH BILATERAL NECK DISSECTION

In order to save time the neck dissections on the two sides should proceed simultaneously with two operating teams When the subdigastric level is reached the head should be turned to one or the other side, when only one team can work until the completion of the neck dissection on that side.

521 An airway has been supplied by the nasotracheal breathing tube A double trifurcate (double-Y) incision has been made with its middle horizontal arm about the level of the lower edge of the thyroid cartilage *A* A circular incision has been marked for the position of the intended tracheal stoma, *B* With two teams working all skin flaps are dissected back, *C*

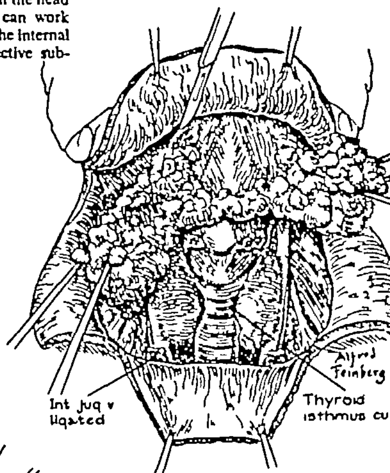


521 Skin incision and bilateral flaps for the neck dissection.

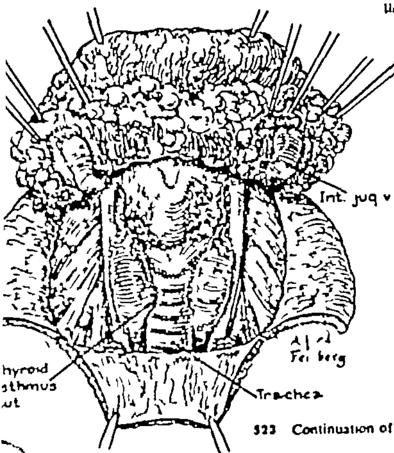
TOTAL LARYNGECTOMY WITH BILATERAL NECK DISSECTION CONTINUED

522 The two neck dissections proceed simultaneously with the routine technic except that the strap muscles (sternohyoid and sternothyroid) are resected

523 When the neck dissections reach the submaxillary area it is usually necessary to turn the head to one side, after which only one team can work at a time until the respective upper ends of the internal jugulars have been severed and the respective submaxillary regions cleared



522 The neck dissections.



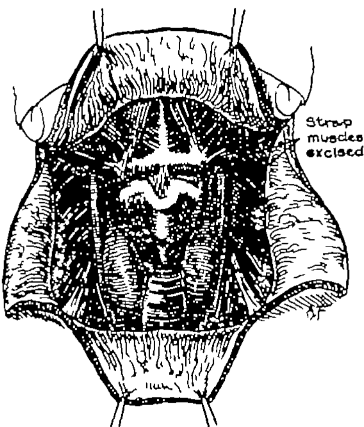
523 Continuation of the neck dissections.

TOTAL LARYNGECTOMY WITH BILATERAL NECK DISSECTION CONTINUED

524 At the completion of the bilateral neck dissection, one of the operative teams drops out, the other remaining to continue with removal of the larynx.

525 The superior cornu of the thyroid cartilage is severed continuing along the fibrous portion of the thyrohyoid ligament.

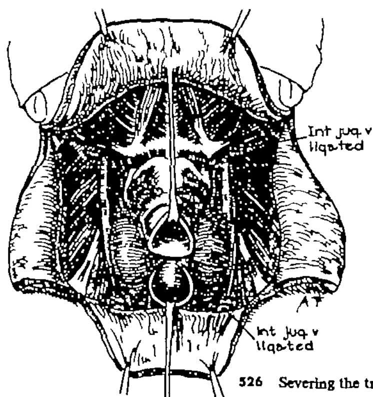
526 The trachea is cut across just below the cricoid cartilage



524 Appearance of the wound following bilateral neck dissections.



525 Mobilization of the larynx.

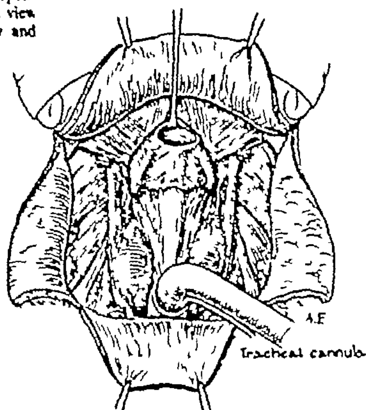


526 Severing the trachea.

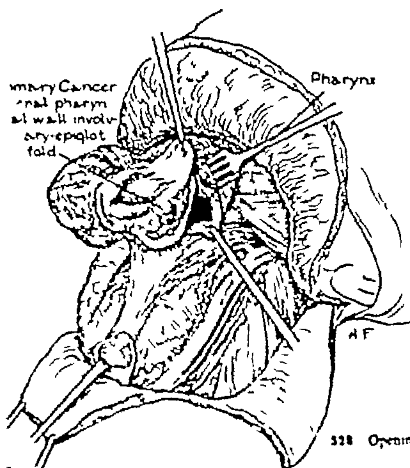
TOTAL LARYNGECTOMY WITH BILATERAL NECK DISSECTION CONTINUED

527 The tracheal breathing tube with an attached inflatable cuff is inserted in the trachea and connected to the anesthesia machine The larynx is mobilized posteriorly from the pharyngeal wall

528 The pharynx is opened above through the mid line at the tip of the epiglottis or through one side wherever a point of entry can be placed furthest away from the growth in the larynx The pharyngeal open ing is widened to bring the growth under direct view as soon as possible so that it may be widely and safely circumscribed



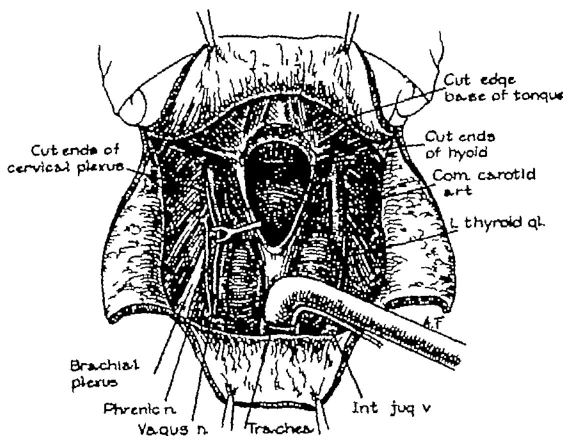
527 Mobilization of the larynx



528 Opening into the pharynx

TOTAL LARYNGECTOMY WITH BILATERAL NECK DISSECTION CONTINUED

529 Safely wide excision of the primary lesion may require removal of a part of the base of the tongue or of the lateral pharyngeal wall.



529 Appearance of the operative wound following bilateral neck dissection and removal of the larynx.

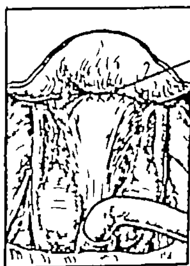
TOTAL LARYNGECTOMY WITH BILATERAL NECK DISSECTION CONTINUED

530 Closure is made by a running locked suture of chromic catgut on a horizontal plane each mucosal stitch including a bite of some soft tissue either muscle tendon or subcutaneous fat When the mucosal closure has been completed, one or two layers of interrupted sutures are placed in the overlying soft parts

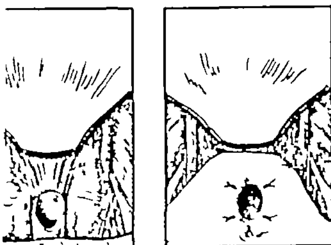
531 An oval-shaped opening through the lower flap is completed The end of the trachea is cut on a bias (see Fig 504) and secured into the margins of the opening using interrupted mattress and superficial sutures Two lateral soft rubber drains are placed

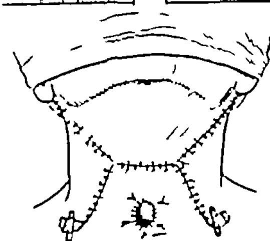






530 Closure of the pharyngeal opening



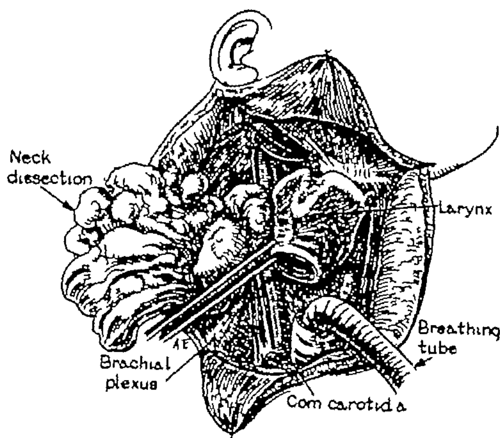


531 Closure of the external wound

SUBTOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION FOR POSTCRICOID CANCER

In postcricoid cancer the excision must extend relatively low along the anterior wall of the esophagus and for this reason there may be considerable difficulty in the closure of the pharyngeal defect. One expedient to lessen this difficulty is to conserve the epiglottis which will provide a wider margin (2.5–3 cm) at the upper edge of the pharyngeal defect

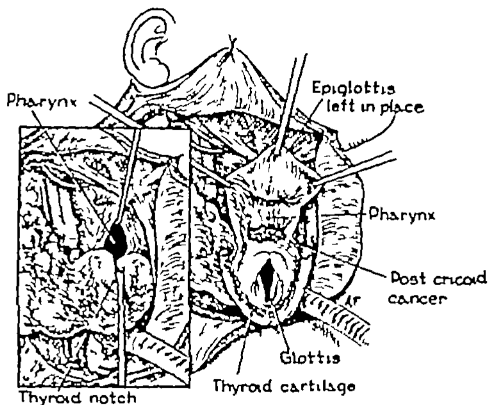
532 A neck dissection has been performed and th larynx mobilized laterally and below The phary has not as yet been opened.



532 Mobilization of the larynx in the later stages of the operation

SUBTOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION FOR POSTCRICOID CANCER CONTINUED

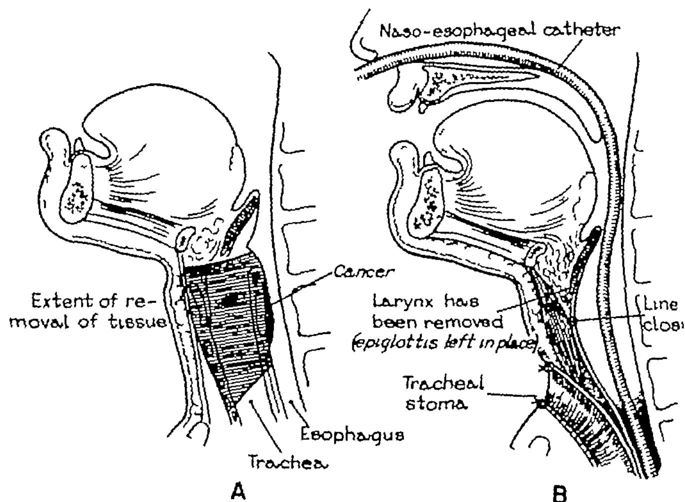
533 The opening is made directly into the larynx by an incision just above the thyroid cartilage cutting through the base of the epiglottis, *A* With the extension of the incision the larynx (minus the epiglottis) is tilted forward exposing the postcricoid area *B*



533 Opening into the pharynx and larynx.

SUBTOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION FOR POSTCRICOID CANCER
CONTINUED

534 The location of the growth in the po... area is shown and the crosshatched portion indica... the block of tissue to be removed It is to be ... that the epiglottis is cut across at its base and ... in place, *A* The line of closure is shown ... the esophageal mucosa to the base of the epiglottis,



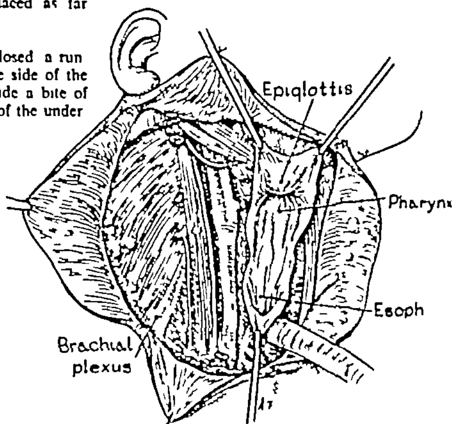
534 A diagrammatic representation of the block of tissues excised and a schema of the closure.

SUBTOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION FOR POSTCRICOID CANCER
CONTINUED

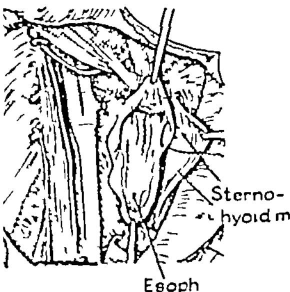
535 The presence of the epiglottis provides a generous length of the upper margin of the pharyngeal defect

536 Closure is begun in a horizontal direction beginning on the side opposite the neck dissection The suture includes a bite of the undersurface of the sternohyoid muscle the first being placed as far posteriorly as possible

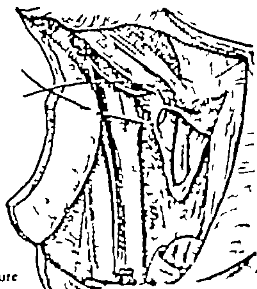
537 When one side has been partly closed a running interlocked suture is begun on the side of the neck dissection The stitches here include a bite of the posterior belly of the digastric and of the under surface of the skin flap



535 The appearance of the wound following removal of the operative specimen



536 Beginning closure of the pharyngeal opening

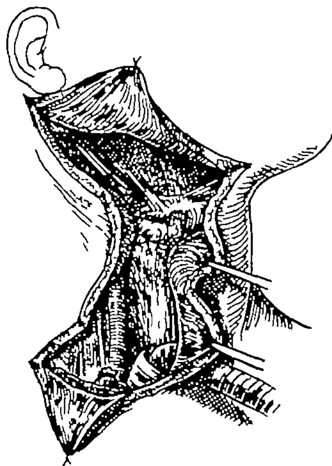


537 Continuation of the closure of the pharyngeal opening

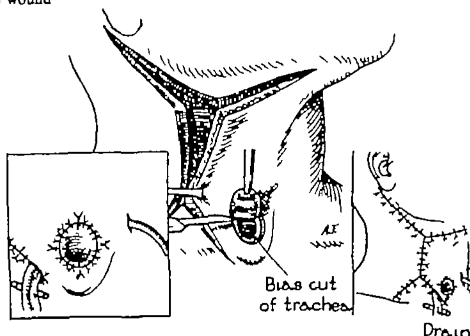
SUBTOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION FOR POSTCRICOID CANCER
CONTINUED

538 The pharyngeal closure has been completed Note that it is being supported by attachment of the suture line to the subcutaneous tissues by an additional layer of sutures

539 Following closure of the pharyngeal opening, a bias cutout is made of the anterior edge of the trachea, which is then sutured to the skin Skin closure and drains are completed in the conventional manner



538 Continuation of closure of the wound



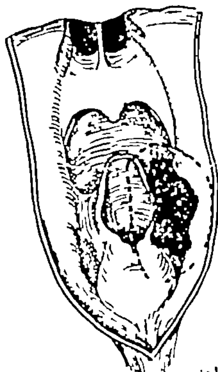
539 Completion of the closure of the external wound.

SUBTOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION FOR UNILATERAL CANCER OF THE EXTRINSIC LARYNX AND/OR LATERAL PHARYNGEAL WALL

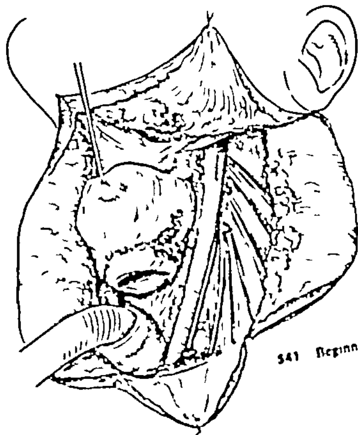
The main objective of this operation is to preserve all or part of one uninvolved side of the extrinsic and intrinsic larynx, to provide a mucous membrane flap for the closure of any extensive defects resulting from wide excision of a growth involving the opposite lateral pharyngeal wall It is to be noted that one of the early steps of the operation is removal of the ala of the thyroid cartilage on the uninvolved side which is to be preserved If (as often happens) the flap is redundant a portion of it may be trimmed The epiglottis may be preserved in whole or in part

540 Lesions suitable for subtotal laryngectomy are mainly those centered in the pharyngoepiglottic fold extending onto the aryepiglottic fold onto the lateral pharyngeal wall and down into the pyriform sinus Much more extensive lesions than that shown here also are resectible with primary closure

541 A neck dissection and left hemithyroidectomy has been completed (In practice the neck dissection specimen is usually left attached to the larynx but is shown removed here for purposes of clarity) The larynx has been detached from the trachea at the lower margin of the cricoid cartilage



540 Cancer of the extrinsic larynx invading the lateral pharyngeal wall and pyriform sinus, for which subtotal laryngectomy is suitable

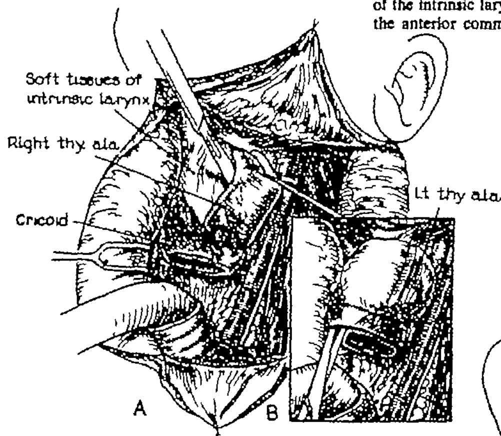


541 Beginning mobilization of the larynx

SUBTOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION FOR UNILATERAL CANCER OF THE EXTRINSIC LARYNX AND/OR LATERAL PHARYNGEAL WALL CONTINUED

542 *A* The larynx has been rotated to the left, t thyrohyoid ligament severed and the scalpel is sho separating the ala along the line of its internal per chrondrium *B* The right thyroid ala has been entire removed and an attempt is being made to separa the subglottic mucosa from the inner surface of t cricoid cartilage.

543 Following removal of one ala of the thyro cartilage and half the cricoid cartilage the soft tissu of the intrinsic larynx are split in the midline up p the anterior commissure



542 Removal of thyroid cartilage.



543 Dividing the larynx in the midline anteriorly

SUBTOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION FOR UNILATERAL CANCER OF THE EXTRINSIC LARYNX AND/OR LATERAL PHARYNGEAL WALL

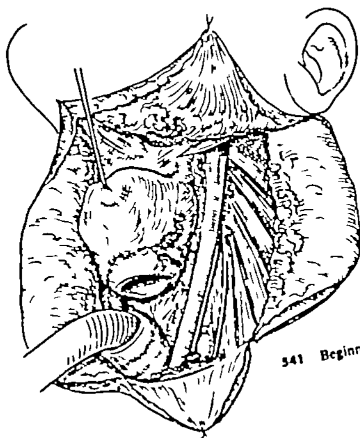
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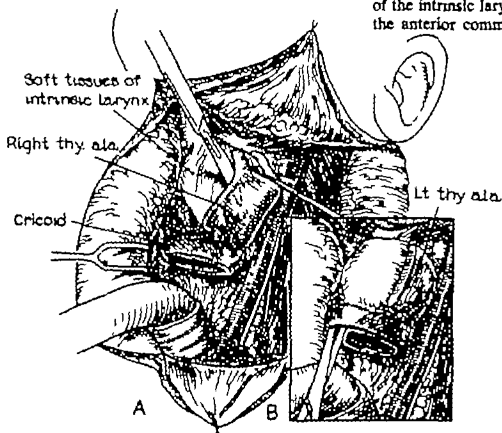


541 Beginning mobilization of the larynx.

SUBTOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION FOR UNILATERAL CANCER OF THE EXTRINSIC LARYNX AND/OR LATERAL PHARYNGEAL WALL CONTINUED

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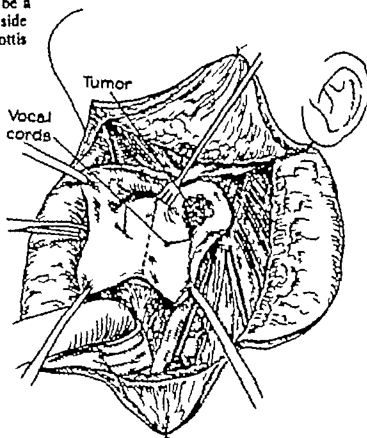


543 Dividing the larynx in the midline anteriorly

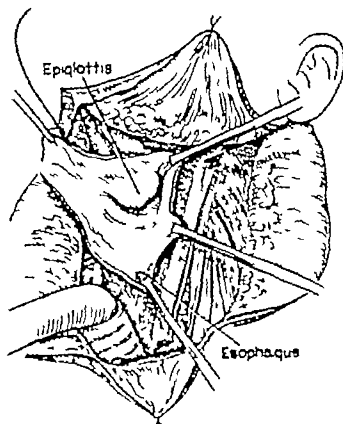
SUBTOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION FOR UNILATERAL CANCER OF THE EXTRINSIC LARYNX AND/OR LATERAL PHARYNGEAL WALL CONTINUED

544 When the sides of the divided larynx are turned back the lesion is exposed and the involved side of the larynx and adjacent extension of growth onto the pharyngeal wall are circumscribed The dotted line indicates the posterior margin of excision.

545 After wide resection of growth there will be a flap of variable dimensions on the uninvolved side including a part or even the whole of the epiglottis If the flap is redundant, it may be trimmed



544 Exposure of the growth.

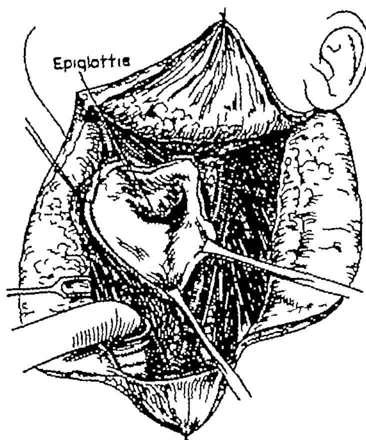


545 The operative field following wide resection of the growth

SUBTOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION FOR UNILATERAL CANCER OF THE EXTRINSIC LARYNX AND/OR LATERAL PHARYNGEAL WALL CONTINUED

546 The most convenient manner of closure of the pharyngeal opening is variable Usually it should begin on the side opposite to the lesion which was excised and carried across more or less horizontally attaching each stitch of the closure to the undersur face of the sternohyoid muscle and undersurface o the skin flap

547 As the closure progresses the epiglottis I turned back up into the pharynx. A feeding cathete has been inserted through the nose and is see (through the open wound) passing down into th esophagus



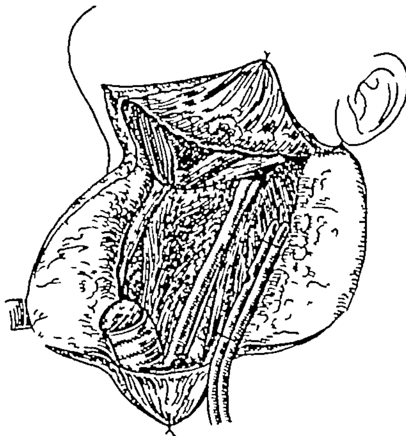
546 Beginning closure of the pharyngeal opening



547 Closure of pharyngeal opening

SUBTOTAL LARYNGECTOMY COMBINED WITH NECK DISSECTION FOR UNILATERAL CANCER OF THE EXTRINSIC LARYNX AND/OR LATERAL PHARYNGEAL WALL CONTINUED

548 When the posterior belly of the digastric can be preserved, the supporting suture for closure of the pharynx may be secured by a bite of that muscle When the opening into the pharynx is large it may be necessary to use the undersurface of the skin flap to stabilize the closure In all cases the skin flap should be sutured down over the pharyngeal closure The trachea is brought out through a circular opening in the skin as shown in preceding illustrations A sump-suction drain (or Lloyd catheter) may be placed in the wound before closure of the skin flaps



548 Final closure of the pharyngeal opening

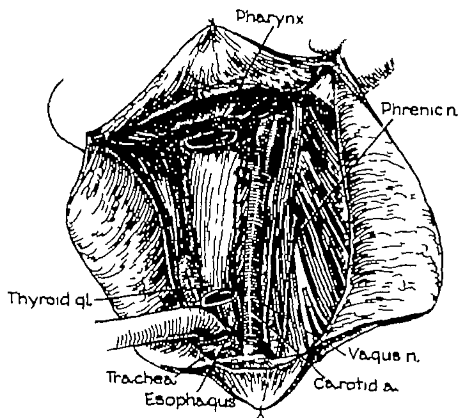
REPAIR OF PHARYNGEAL DEFECT BY SPI GRAFT ON LATEX STENT

In most cases of pharyngolaryngectomy the defect can be closed by primary suture without the use of skin graft, even when an end-to-end annular approximation and suture of the pharynx and esophagus must be made

In other extensive resections the best solution may be either to leave a pharyngostome or to close the pharynx and bring the upper end of the esophagus out through the incision in the lower neck (Fig. 515) The operative technic described below is that which has been found most often successful in the Head and Neck Clinic at Memorial Hospital The latex stent is of construction shape and dimension first proposed by Negus (Fig. 62)

At the completion of the operation a feeding tube is inserted through the channel in the stent, the upper end of the stent protrudes into the pharynx at about the level of the tonsil The stent should be left in place for several weeks Stricture in the pharynx is a common complication due to failure of some portion of the graft to "take," or because split-skin grafts, wherever applied, tend to shrink. Many patients require daily bouginage to maintain a passage way sufficient for swallowing.

549 An annular excision of the pharyngeal has been made (pharyngolaryngectomy)

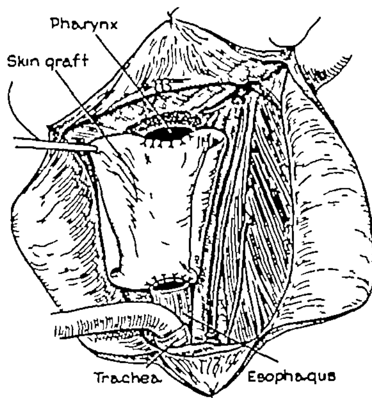


549 Appearance of the operative field following pharyngolaryngectomy

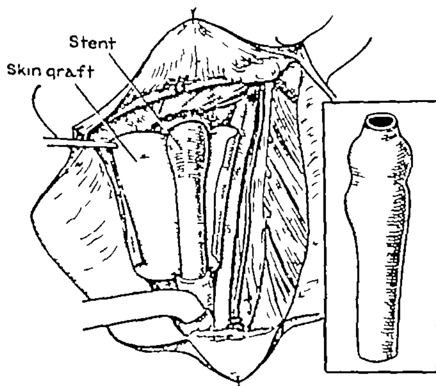
REPAIR OF PHARYNGEAL DEFECT BY SPLIT SKIN GRAFT ON LATEX STENT CONTINUED

550 A split skin graft is sutured posteriorly above and below before the insertion of the latex stent.

551 After partial attachment of the skin graft above and below the latex rubber stent is laid in place.



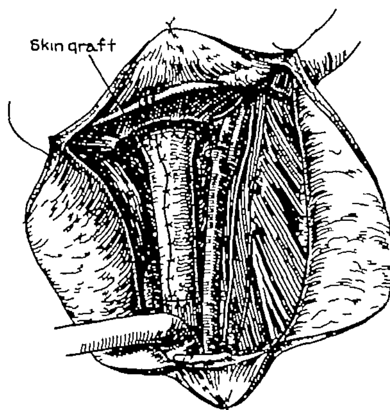
550 Placement of the skin graft.



551 Placement of the stent.

REPAIR OF PHARYNGEAL DEFECT BY SPLIT GRAFT ON LATEX STENT CONTINUED

552 The skin graft is folded upon itself and t suture completed around the margins of the geal and esophageal openings respectively The line is then continued downward to completely co the stent Then the anterior skin flaps are down to the base of the wound and to the raw face of the skin flap to leave as little dead space possible



552 Suture of the skin graft over the stent.

Z PLASTIC FOR ENLARGEMENT OF MICROSTOMIA FOLLOWING TOTAL LARYNGECTOMY

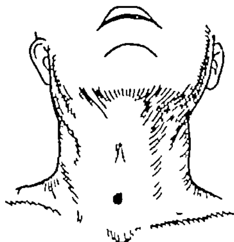
In microstomia the greatest contracture usually has taken place at the lower margin of the tracheal stoma. To enlarge the opening, there are required both an excision of the scar tissue and a transposition of flaps of skin and tracheal mucosa in the form of a Z plastic.

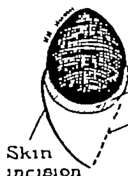
553 A strip of hypertrophied scar is first removed from the lower edge of the stoma Two incisions then are made one externally and the second within the trachea so as to form Z flaps

554 The external flap has been laid back and a section of the anterior wall is outlined for excision.

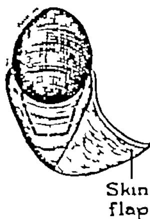
555 After excision of a portion of the tracheal wall an internal flap of mucosa is developed

556 By transposition of the flaps (Z plastic) the caliber of the stoma is increased

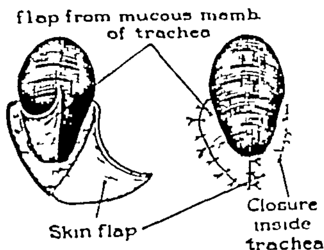




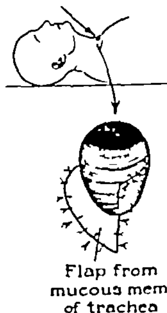
553 Position of incisions and excision of scar



Excision of a segment of the
erior tracheal wall



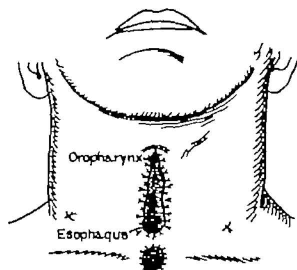
555 Formation of flaps.



556 Appearance of the tracheal stoma as viewed from above

DELAYED CLOSURE OF A PHARYNGEAL ST FOLLOWING TOTAL LARYNGECTOMY

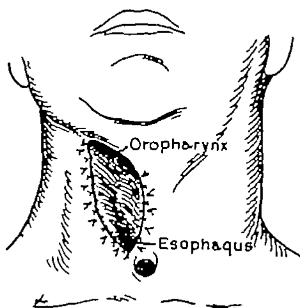
Pharyngeal stomas of small or moderate size may occur either as a result of an elective in complete closure of the wound following total laryngectomy or, less often, as a result of failure of primary union and wide breakdown of the wound The smaller openings may be closed by transposition of the flaps of adjacent skin.



557 Anterior pharyngostome.

557 When the pharyngostome technic is c plated, provision should be made to bring a stump through a separate opening 1.5–2 cm the lower end of the midline incision The of the edge of the pharyngeal opening is the skin with multiple interrupted sutures

558 Occasionally when larynx cancer is after partial laryngectomy the disease may be unilateral and invade the subcutaneous tissues such cases the pharyngostome may be laterally center



558 Lateral pharyngostome.

Z PLASTIC FOR ENLARGEMENT OF MICROSTOMIA FOLLOWING TOTAL LARYNGECTOMY

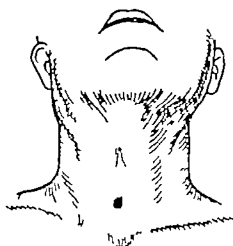
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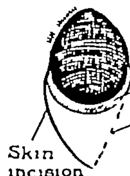
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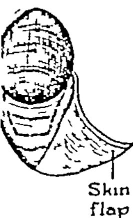
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556 By transposition of the flaps (Z plastic) the caliber of the stoma is increased

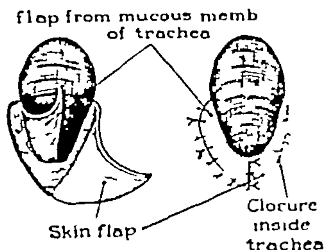




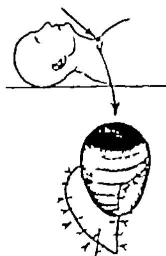
553 Position of incisions and excision of scar



Excision of a segment of the tracheal wall



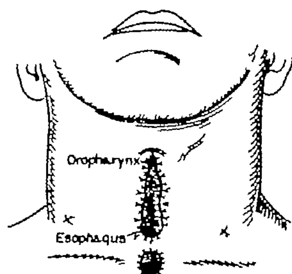
555 Formation of flaps.



556 Appearance of the tracheal stoma as viewed from above

DELAYED CLOSURE OF A PHARYNGEAL STOMA FOLLOWING TOTAL LARYNGECTOMY

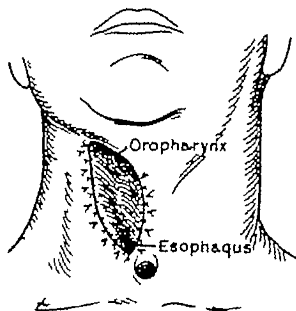
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557 *Anterior pharyngostome.*

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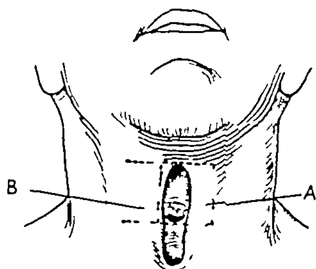


558 Lateral pharyngostome.

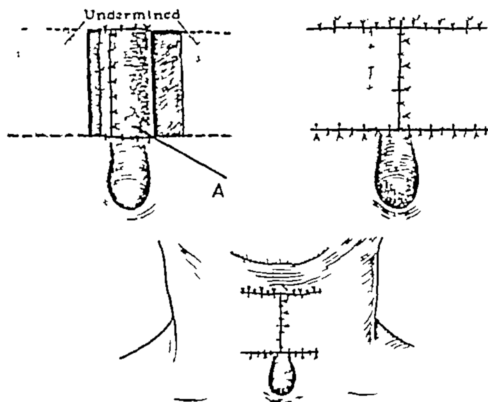
CLOSURE OF PHARYNGOSTOME BY "TRAP-DOOR" PLASTIC

559 The flap on the left, *A* is to be turned, skin surface in into the pharynx and the flap on the right, *B* is to be advanced to cover the whole external wound

560 The horizontal incisions have been extended. The left flap *A* has been raised, turned toward the opposite side and sutured to the freshened margins at the end above and below The remaining lateral flaps have been undermined and are advanced so that the external suture line is not directly superimposed over the buried suture line.



559 The incisions.



560 The skin flaps and closure

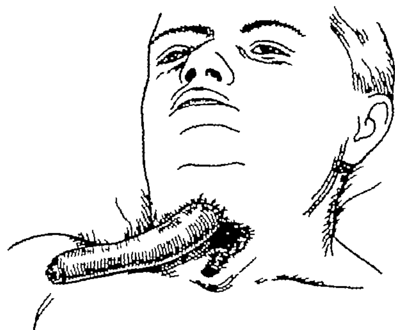
OPERATIONS OF THE LARYNX (Figs. 561–564)

CLOSURE OF LARGE PHARYNGEAL STOMA BY TUBED PEDICLE FLAP

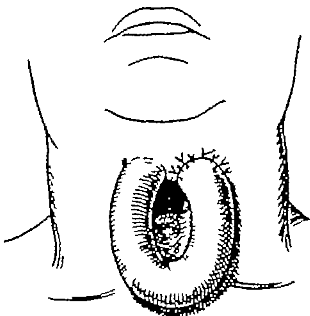
Pharyngeal stomas of large size, or those whose edges are markedly scarred, are not suitable for closure by adjacent flaps, and transfer *of larger masses of tissue by tubed pedicle flaps* will be required.

561 A previously formed tubed pedicle graft (fı the clavicular area) has been walked into place one end migrated into the upper edge of the pharyngeal defect.

562 After an interval of about a month, the end is migrated to a corresponding position at upper margin of the pharyngeal defect.



561 Migration of the tubed pedicle.

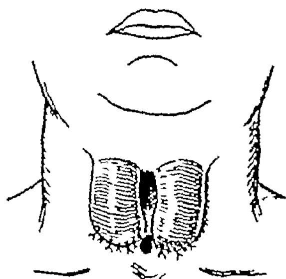


562 Further migration of the tubed pedicle

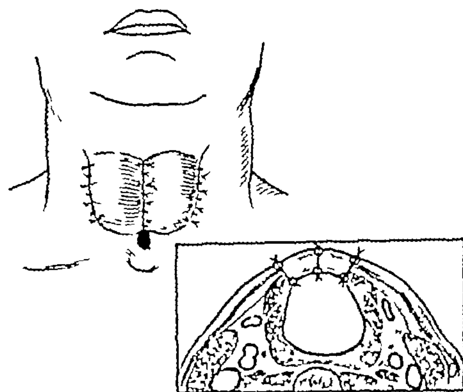
CLOSURE OF LARGE PHARYNGEAL STOMA BY TUBED PEDICLE FLAP CONTINUED

563 After a further interval of a month the tube is sectioned in the middle and the two ends sutured *into incisions at the lower margins of the pharyngeal defect.*

564 After a suitable interval the four edges of the two tubes are *freshened and fused externally* and internally



563 Division and reattachment of the tubed pedicle



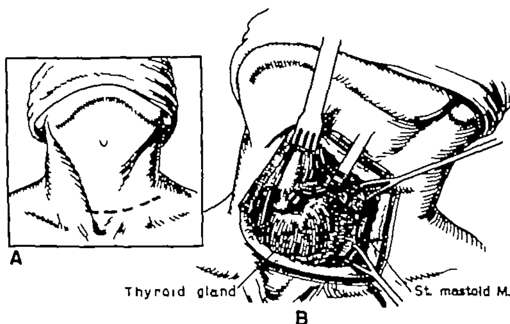
564 Fusion of the margins of the transplant for closure of the pharyngostome

EXCISION OF ESOPHAGEAL DIVERTICULUM

Diverticula of the upper end of the esophagus arise from its posterior wall at the level of the cricoid cartilage Actually this out pouching oc curs between the pars obliqua and the pars fundiformis of the inferior constrictor of the pharynx just above the upper end of the esoph agus proper The sac may remain almost in the midline or it may extend laterally usually toward the left.

The most direct surgical approach is there fore, lateral to beneath and then mesial to the thyroid lobe either by elevating and re- tracting it mesially or, should it be enlarged (adenoma or nodular goiter) by resecting one lobe While the oldest and most commonly used incision is the oblique along the anterior border of the sternomastoid muscle, a more practical approach is by the standard collar incision for thyroid surgery centered slightly to the left of the midline unless the radiograph shows that the sac definitely has extended to the right. Lacking any such special indication, a left-sided ap- proach is preferable since on that side the re- current nerve tends to lie closer to the trachea, while on the right the nerve sometimes crosses over more obliquely and superficially

565 A horizontal collar incision is made slightly ‹ center to the left, *A* The sternomastoid muscle retracted *B* and the strap muscles sectioned as the standard approach to a lateral lobe of the u (see Fig. 578)



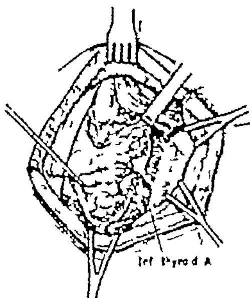
565 The incision and superficial exposure.

EXCISION OF ESOPHAGEAL DIVERTICULUM
CONTINUED

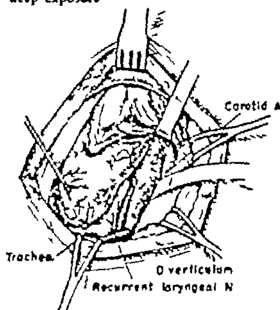
566 567 The posterolateral border of the thyroid lobe is elevated and retracted mesially If the lobe is even moderately hypertrophied or involved by nodular goiter a lobectomy at this stage is advisable.

568 Ordinarily the wall of the diverticulum is not too difficult to identify When the sac is even of moderate size however the wall tends to be thin and may be easily torn rendering further mobilization *more difficult* When there is reasonable assurance that the major portion of the sac has been delivered sutures are placed on opposite sides of the neck of the sac on a horizontal line These sutures will hold the opening secure after excision of the sac

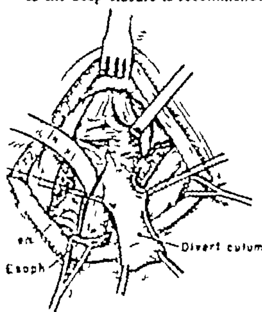
569 The opening into the esophagus is closed by a running locked stitch in a double layer The subsequent closure of the superficial wound is the same as in thyroid lobectomy A single Penrose rubber drain to the deep closure is recommended for 48 hours



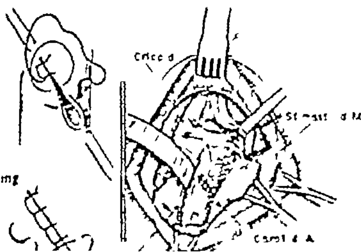
566 Mobilization of the thyroid lobe and deep exposure



567 Mobilization of the thyroid lobe and deep exposure



1 Delivery of the diverticulum



569 Closure of the esophageal opening

Chapter 22

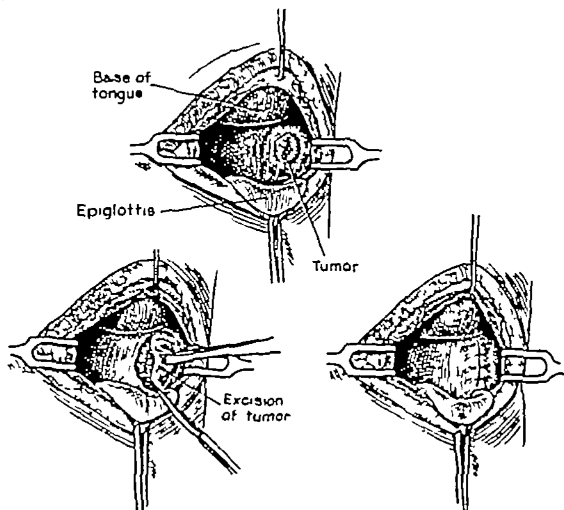
OPERATIONS FOR GROWTHS OF THE PHARYNGEAL WALLS

OPERATIONS FOR GROWTHS OF THE PHARYNGEAL WALLS (Fig 570)

EXCISION OF SMALL TUMOR OF THE PHARYNGEAL WALL THROUGH ANTERIOR PHARYNGOTOMY

(For preceding stages in anterior pharyngotomy see Figs 114–118)

570 Small growths can be circumscribed by a circular incision resected down to the fascial layer over the pharyngeal spine and the incision closed by interrupted sutures

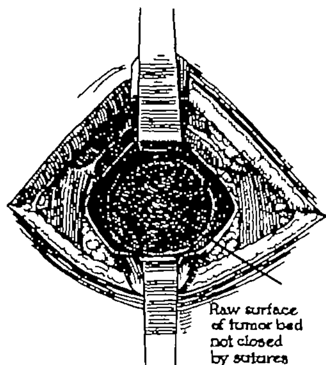


570 Excision of small pharyngeal growths and closure of the wound.

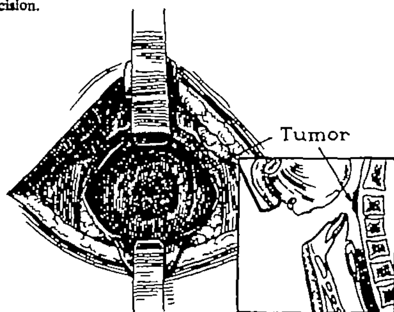
REMOVAL OF EXTENSIVE CANCER OF THE POSTERIOR WALL THROUGH ANTERIOR PHARYNGOTOMY: CLOSURE BY SECONDARY INTENTION

571 Large infiltrating carcinomas of the posterior pharyngeal wall should be widely excised without regard to the problem of closure.

572 Mucosal defects which overlie the bodies of the cervical vertebrae cannot and should not be closed. They should be left to heal by secondary intention. There is no risk of stricture since the bony posterior wall cannot contract.



571 Position of the tumor and line of excision.



572 Appearance of the wound after excision of carcinoma.

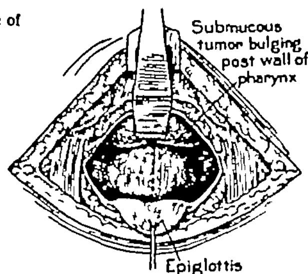
OPERATIONS FOR GROWTHS OF THE PHARYNGEAL WALLS (Figs. 573–577)

REMOVAL OF SUBMUCOUS BULGING TUMOR OF POSTERIOR PHARYNGEAL WALL

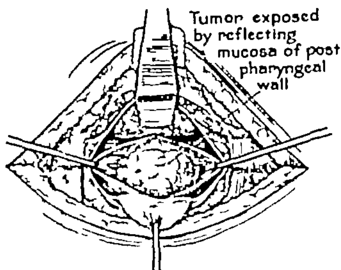
Most noninfiltrating submucous tumors of the posterior pharyngeal wall are fibromas (a part of generalized Von Recklinghausen's disease) or possibly chordomas The best approach is through anterior pharyngotomy (see Figs 114–118)

573 Through a transverse incision at the level of the hyoid and section of sternohyoid muscles the pharyngeal cavity is entered through the vallecula, exposing the retropharyngeal tumor

574 The mucosa is incised exposing the surface of the tumor



573 Exposure of the posterior pharyngeal wall through anterior pharyngotomy

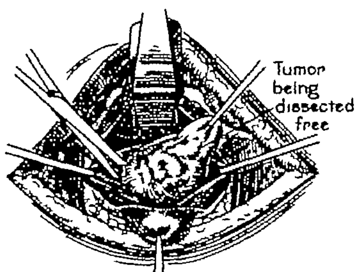


574 Exposure of the retropharyngeal tumor by a mucosal incision

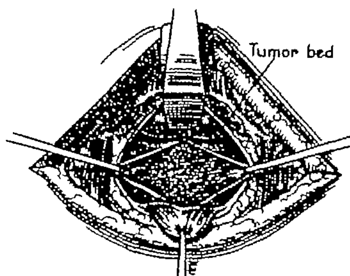
REMOVAL OF SUBMUCOUS BULGING TUMOR OF POSTERIOR PHARYNGEAL WALL CONTINUED

575 576 The noninfiltrating tumor is freed by blunt and sharp dissection and removed

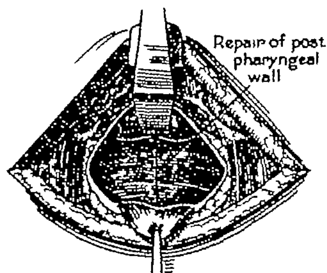
577 The mucosal wound is closed by direct suture without drainage



575 Mobilization of the tumor



576 Operative field following excision of the tumor



577 Closure of the mucosal wound by direct suture.

Chapter 23

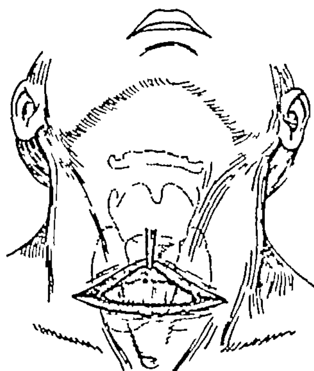
OPERATIONS FOR THYROID TUMORS

HEMITHYROIDECTOMY (LOBECTOMY)

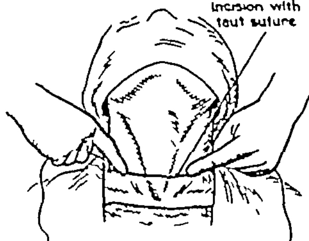
Depending upon the extent, the operation of thyroidectomy may be classified as follows *partial thyroidectomy* (removal of part of one lobe) *hemithyroidectomy* or *lobectomy* *subtotal thyroidectomy* and *total thyroidectomy* Any of these operations may be combined with unilateral or occasionally bilateral neck dissection. In thyroidectomy for tumor (either adenoma or cancer) all of the affected lobe should be removed. In cases of thyroid cancer (proved either by previous biopsy or by frozen section) a neck dissection of the affected side should be performed

578 The line of the collar incision may be imprinted in the skin by pressure of a taut suture When intravenous anesthesia is used the extension of the arm may result in an oblique line of incision Care, therefore should be taken to bring the arm down to the level of the shoulders while selecting the line and direction of incision The incision is carried down to the strap muscles.

579 The sternomastoid muscles are retracted laterally and the strap muscles cut across the sternohyoids are cut completely the sternothyroids optionally cut completely or only in part.



578 The incision.



Platysma

Pretracheal muscles

Sternomastoid M

Pretracheal muscles (cut)

Thyroid

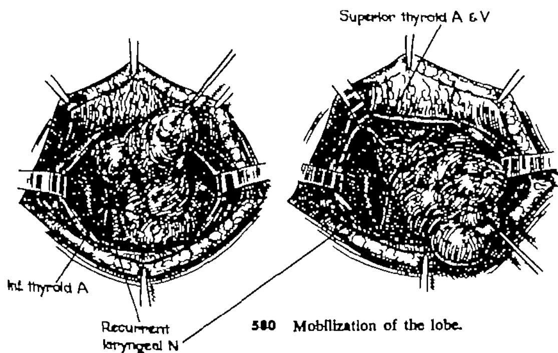
579 Deep exposure

HEMITHYROIDECTOMY (LOBECTOMY) CONTINUED

580 The lower pole of a thyroid lobe should be mobilized first. The recurrent nerve should be identified early After mobilization of the lower pole and identification of the recurrent nerve, the upper pole is mobilized by section of the superior thyroid artery and vein

581 After freeing the upper pole the thyroid lobe is retracted mesially to expose the isthmus

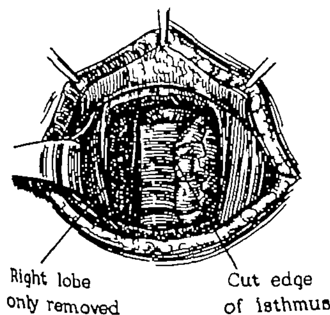
582 The isthmus is clamped sectioned and the lobe removed



580 Mobilization of the lobe.



581 Further mobilization of the



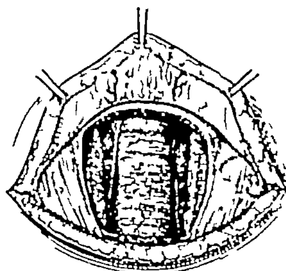
582 Section through the isthmus.

HEMITHYROIDECTOMY (LOBECTOMY) CONTINUED

583 In total thyroidectomy the isthmus is left intact and the opposite lobe is mobilized in the manner already described Both recurrent nerves should be identified and preserved

584 In the closure of collar incisions it is useful to flex the neck on the body *B* rather than to maintain the extended position *A* usually employed during the operation itself

585 No drains should be employed in simple thyroid surgery (hemithyroidectomy total thyroidectomy) The strap muscles are closed by mattress sutures followed by subcuticular sutures and skin clips



583 Total thyroidectomy

Neck extended during op

a

Neck flexed during closure

b

Closure of collar incision in thyroid surgery

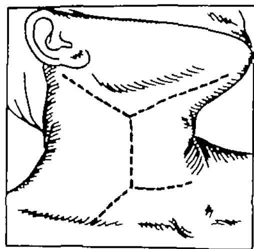
Subcuticular sutures

Mattress suture of pretracheal muscles

THYROIDECTOMY AND NECK DISSECTION

This procedure should be performed in one stage in all cases of proven cancer limited to one lobe of the thyroid If there is bilateral disease a total or subtotal thyroidectomy combined with neck dissection may be elected, or two neck dissections may be staged The procedure here illustrated represents that which would be followed in cases where preoperative diagnosis of cancer has been made When the diagnosis must be made by frozen section the standard collar thyroid incision is extended to permit of neck dissection.

586 The incision is the same as for radical neck dissection except that the lower mesial arm may run more transversely across the midline of the neck The neck dissection begins in the routine manner by section of the lower end of the sternomastoid muscle



Ext max. vessels cut and looped up and sutured to protect
Ramus marginalis mandibulae, VII cr N.
Ext jug V
St mastoid M (cut)
Alfred Feinberg

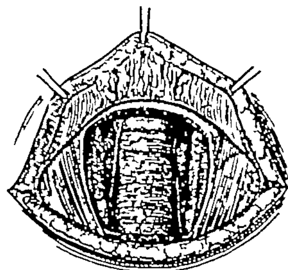
586 Incision and mobilization of the superficial flaps.

HEMITHYROIDECTOMY (LOBECTOMY) CONTINUED

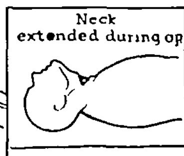
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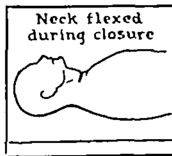
584 In the closure of collar incisions it is useful to flex the neck on the body *B* rather than to maintain the extended position *A* usually employed during the operation itself

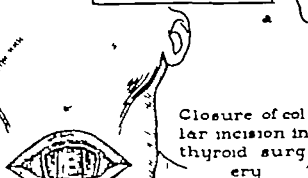
585 No drains should be employed in simple thyroid surgery (hemithyroidectomy total thyroidectomy) The strap muscles are closed by mattress sutures followed by subcuticular sutures and skin clips



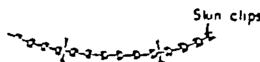
583 Total thyroidectomy

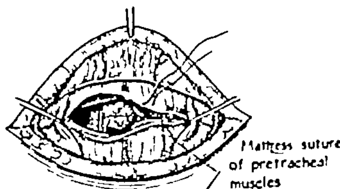


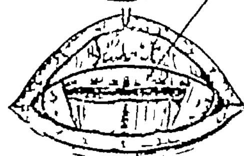










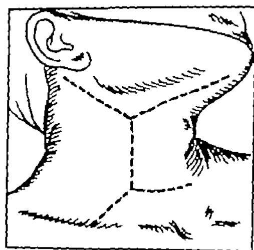


585 Closure of the wound.

THYROIDECTOMY AND NECK DISSECTION

This procedure should be performed in one stage in all cases of proven cancer limited to one lobe of the thyroid If there is bilateral disease a total or subtotal thyroidectomy combined with neck dissection may be elected, or two neck dissections may be staged The procedure here illustrated represents that which would be followed in cases where preoperative diagnosis of cancer has been made. When the diagnosis must be made by frozen section the standard collar thyroid incision is extended to permit of neck dissection.

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Ext max vessels cut and looped up and sutured to protect

Ramus marginalis mandibulae, VII cr N

Ext jug V

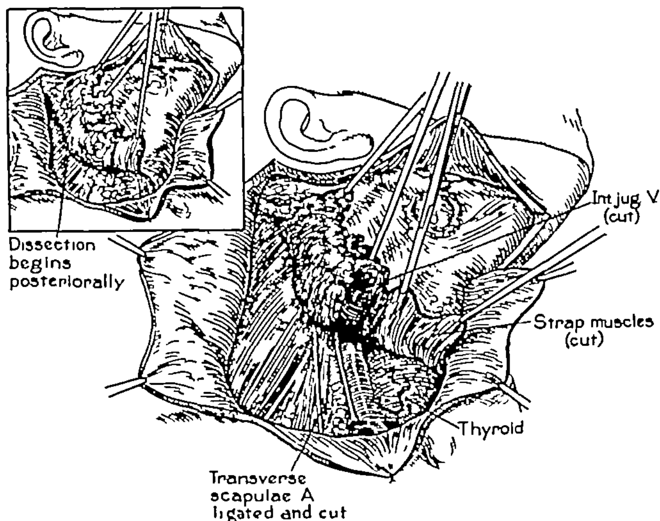
St mastoid M (cut)

Alfred Feinberg

586 Incision and mobilization of the superficial flaps.

THYROIDECTOMY AND NECK DISSECTION
CONTINUED

587 The block dissection proceeds posteriorly and below severing the sternomastoid omohyoid and pretracheal muscles The internal jugular vein is sectioned just above the clavicle

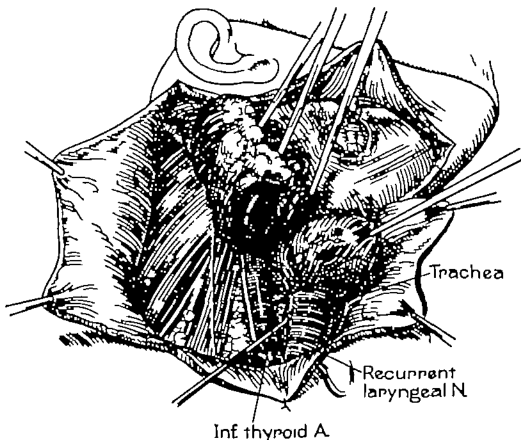


587 Beginning the dissection.

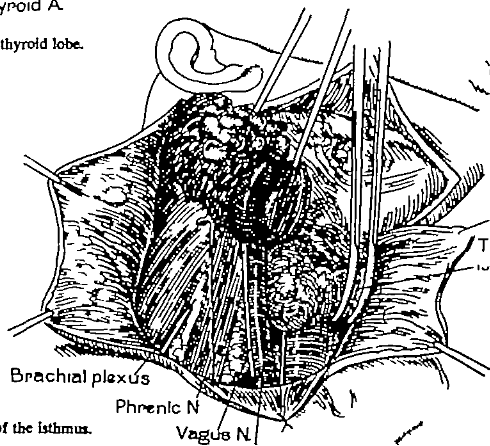
THYROIDECTOMY AND NECK DISSECTION
CONTINUED

588 The lower pole of the thyroid lobe is - and the recurrent nerve identified and presen provided it is not invaded by cancer

589 After mobilization of the thyroid lobe a is selected for transection of the isthmus



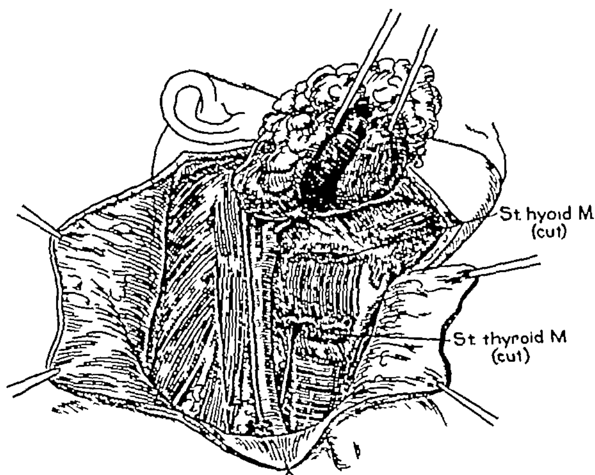
588 Beginning mobilization of the thyroid lobe.



589 Section of the isthmus.

THYROIDECTOMY AND NECK DISSECTION
CONTINUED

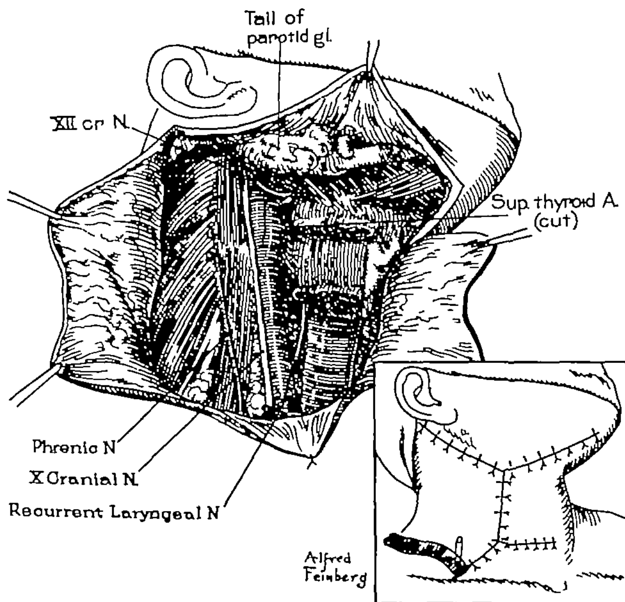
590 The dissection then proceeds upward keeping the recurrent nerve in view The strap muscles are removed at their attachments to the thyroid cartilage and hyoid bone



590 Dissection of the upper portion of the neck.

THYROIDECTOMY AND NECK DISSECTION
CONTINUED

591 The dissection is completed by clearing out › submaxillary triangle and the subdigastric area A Penrose rubber drain with upper end at the sub digastric area is led out through the posterior arm the incision

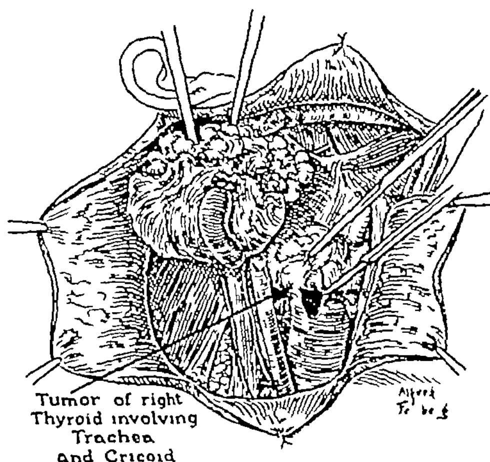


591 The completed operation and closure of the wound.

WINDOW RESECTION OF THE TRACHEA FOR INVASION BY THYROID CANCER

Most thyroid cancer tends to pursue a long clinical course and permanent cures may be obtained in many cases by the excision of portions *of the larynx or trachea that have been invaded* by the disease

592 At the site of the invasion an incision is made into the trachea and the involved portions of the tracheal wall and the cricoid cartilage are removed

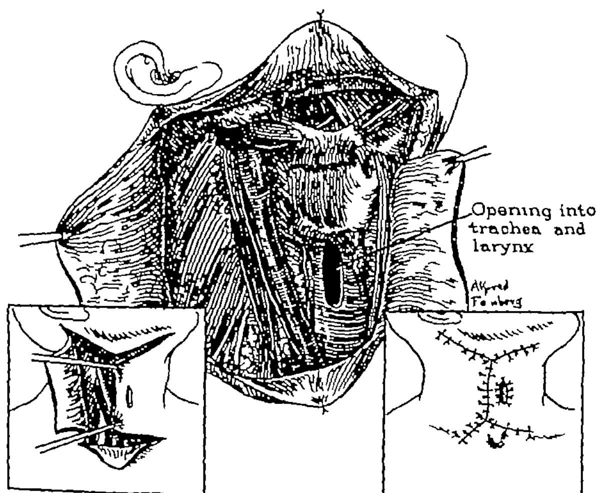


592 Primary growth is found to be invading the trachea.

WINDOW RESECTION OF THE TRACHEA FOR INVASION BY THYROID CANCER

CONTINUED

593 The mesial skin flap is pulled over the u defect and an aperture is made in the skin, the ˬ ˬ of which are sutured to the periphery of the ı defect This opening may be left permanently the lumen of the airway above be considered doubtful adequacy In some cases the opening w almost completely close spontaneously or in it may be closed by a subsequent procedure

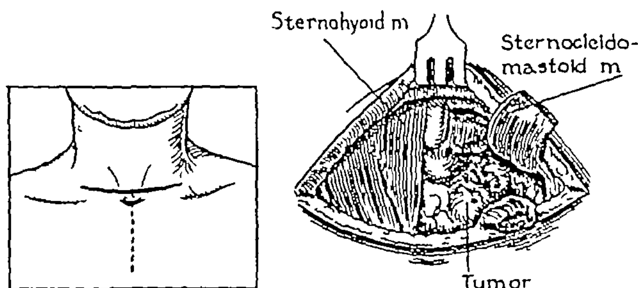


593 Completed window resection of trachea and closure of the wound.

SUBSTERNAL THYROID TUMORS

Most thyroid tumors that extend a moderate distance beneath the sternum may be mobilized and enucleated by blunt finger dissection In bulky thyroid tumors it is best to be prepared to split the sternum to get better exposure

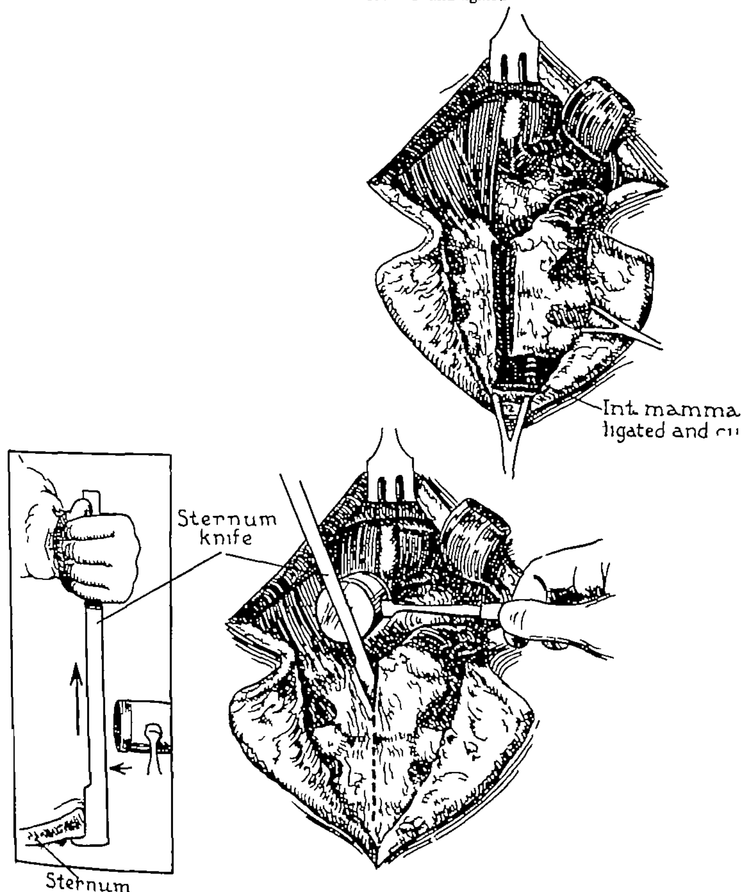
594 The usual horizontal incision is made, to be supplemented by a vertical arm if preliminary exploration suggests that the tumor cannot be removed without splitting the sternum After section of the sternomastoid and the pretracheal muscles on at least one side the substernal area may be explored digitally to decide whether removal is possible



594 Skin incision and preliminary exposure

SUBSTERNAL THYROID TUMORS CONTINUED

595 After exposing the upper portion of the ster num a sternum knife is applied in the notch and the sternum split vertically and then zontally into the second or third intercostal ₛₚ ᵃᶜᵉ The internal mammary artery is identified, ᶜˡ severed and ligated

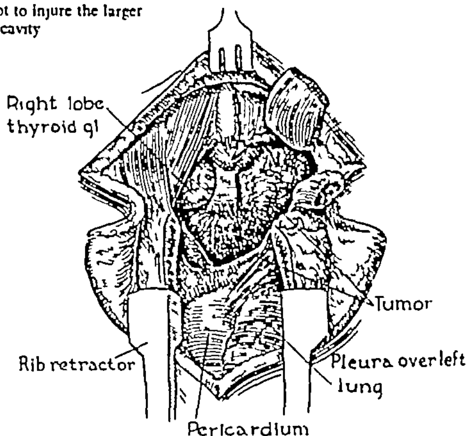


595 Splitting the sternu

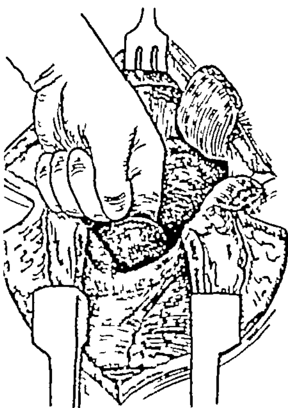
SUBSTERNAL THYROID TUMORS CONTINUED

596 With a self retaining retractor the edges of the sectioned sternum are separated exposing the anterior mediastinum and its contents The isthmus of the thyroid is sectioned.

597 By digital blunt dissection the substernal tumor is mobilized care being taken not to injure the larger vessels nor to enter the pleural cavity



596 Exposure of the substernal area

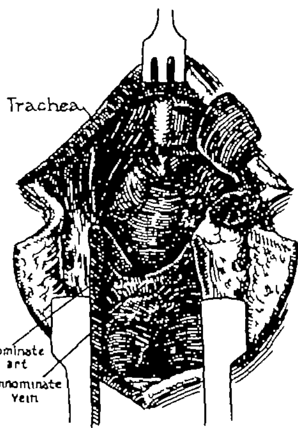


Digital exploration of the interior medium and mobilization of the tumor

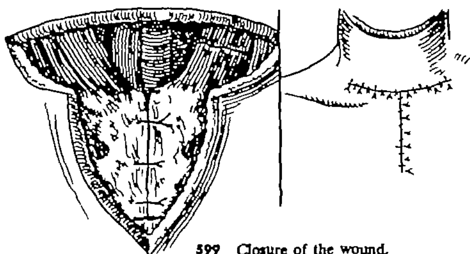
SUBSTERNAL THYROID TUMORS CONTINUED

598 After removal of the tumor with one lobe innominate vein will lie in the depths of the wo crossing from right to left.

599 Following the removal of the substernal tumor the divided sternum is resutured with chromic gut threaded through holes drilled through the bone T sternomastoid muscle is resutured The skin is closed without drainage



598 The operative field following removal of the tumor

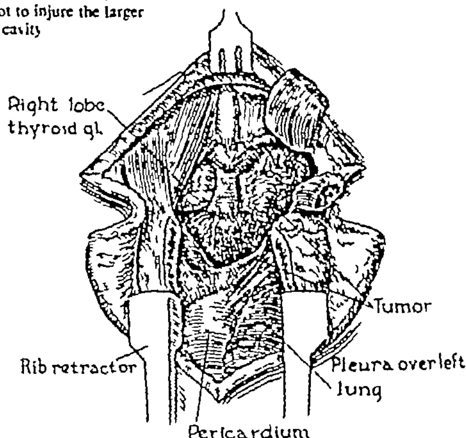


599 Closure of the wound.

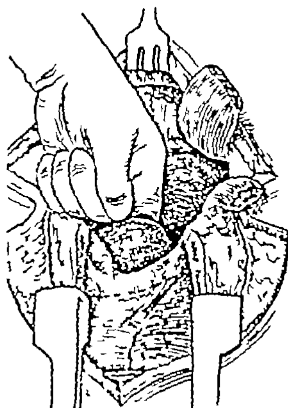
SUBSTERNAL THYROID TUMORS CONTINUED

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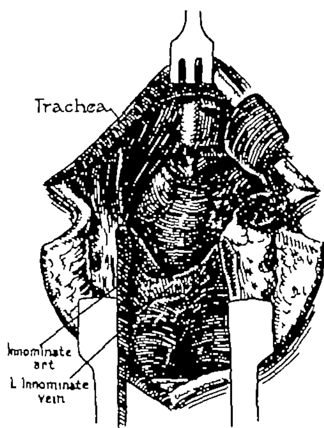
597 By digital blunt dissection the substernal tumor is mobilized care being taken not to injure the larger vessels nor to enter the pleural cavity



596 Exposure of the substernal area



97 Digital exploration of the interior medi
inum and mobilization of the tumor

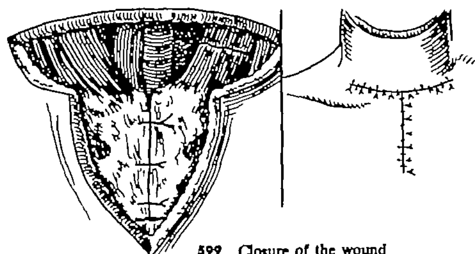


598 The operative field following removal of the tumor

SUBSTERNAL THYROID TUMORS CONTINUED

598 After removal of the tumor with one lobe innominate vein will lie in the depths of the crossing from right to left.

599 Following the removal of the substernal tumor the divided sternum is resutured with chromic catgut threaded through holes drilled through the bone T sternomastoid muscle is resutured. The skin is closed without drainage



599 Closure of the wound

APPENDIX A

INSTRUMENT LISTS FOR HEAD AND NECK OPERATIONS

With the use of the several established sets of instruments, the preparation for any head and neck surgery can be simplified If the nature of the operation is clearly stated on the "operating schedule," the instrument nurse can refer to any one of the 47 classes of operative procedures listed here and be assured that required instruments will be available when requested. The "extra," or "special instruments necessary for a specific operation are not easily overlooked when check lists such as these are used. For a long schedule of head and neck operations, a reserve table can be set up with a supply of basic instruments so that a separate and distinct set for each operation will not be necessary

INSTRUMENT LISTS FOR HEAD AND NECK OPERATIONS

Basic Set No. 1

Quantity	*Description*
	FORCEPS
2	Toothed tissue forceps, 4½"
2	Toothed tissue forceps, 6"
3	Sponge holding forceps
	HEMOSTATS
6	Forceps, curved, 5½" (Kelly)
60	Mosquito forceps, straight (Halstead)
50	Forceps, straight (Kelly)
6	Curved forceps, 6¼" (Rochester-Ochsner)
	NEEDLE HOLDERS
3	Needle holders, 6"
	RETRACTORS
2	Small loop retractors (Greene)
2	Blunt retractors, 4-prong (Volkman)
2	Blunt retractors, 2-prong (Volkman)
2	Small retractors (Langenbeck)
2	Tongue depressors (Bosworth)
4	Tissue hooks (Frazier)
2	Tonsil dissectors (Hurd)
	RULERS
1	Metal 6" ruler in inches and centimeters
	SCALPELS
2	Bard-Parker handles, #3
1	Bard Parker handles, #4
3	Bard-Parker blades, Size 10
1	Bard-Parker blade, Size 11
1	Bard Parker blade, Size 15
1	Bard Parker blade, Size 20
	SCISSORS
1	Dissecting scissors, curved 5½" (Mayo)
2	Dissecting scissors, straight 5" (Mayo)
1	Plastic scissors, curved 4¾"
1	Suture scissors, straight, sharp-blunt, 5½"
	SUCTION TUBES
2	Suction tubes (Yankauer)
2	Head and neck suction tubes, straight, 8"
	TENACULA
6	Forceps, 4 x 5 teeth, 6" (Allis)
4	Tracheostomy hooks, 1 prong
12	Towel forceps, 3" (Backhaus)
6	Tissue hook clamps (Adair)
	CATHETERS
1	Whistle-tip red rubber catheter 14 Fr with Sim's tip
1	Whistle tip red rubber catheter 16 Fr., with Sim's tip

BASIC SET NO. 2

Quantity	Description
	FORCEPS
2	Toothed tissue forceps, straight 4½"
2	Toothed tissue forceps, 6" with many teeth
3	Sponge-holding forceps
	HEMOSTATS
12	Artery forceps, curved (Kelly)
48	Artery forceps, straight (Kelly)
12	Artery forceps, curved mouse tooth, 6¼" (Rochester-Ochsner)
120	Mosquito forceps, straight (Halstead)
	MOUTH GAGS
1	Mouth gag (Denhardt)
1	Mouth gag (Roser Koenig)
1	Tongue depressor (Bosworth)
1	Tongue depressor (Andrew)
	NEEDLE HOLDERS
4	Needle holders, 6"
	RETRACTORS
2	Retractors, regular (Langenbeck)
2	Retractors, small (Langenbeck)
2	Loop retractors, regular (Greene)
2	Loop retractors, small (Greene)
2	Blunt retractors, 6-prong (Volkman)
2	Blunt retractors, 4-prong (Volkman)
2	Blunt retractors, 2-prong (Volkman)
2	Tonsil dissectors (Hurd)
	RULER
1	Metal 6" ruler in inches and centimeters.
	SCALPELS
3	Bard Parker handles, #3
1	Bard Parker handle, #4
3	Bard Parker blades, Size 10
1	Bard-Parker blade, Size 11
1	Bard Parker blade Size 15
2	Bard-Parker blades Size 21
	SCISSORS
1	Dissecting scissors, curved, 5½" (Mayo)
2	Dissecting scissors, straight, 5½" (Mayo)
1	Plastic scissors, curved 4¾"
1	Plastic scissors, straight 4¾"
1	Suture scissors, straight, sharp-blunt, 5½"
1	Tonsil scissors, curved, 7" (Metzenbaum)
	SUCTION TUBES
2	Suction tubes (Yankauer)
2	Head and neck suction tubes, straight, 8"

Quantity	Description
	TENACULA
6	Forceps, 6" (Allis)
6	Tissue hook clamps (Adair)
3	Tracheostomy hooks, 1-prong
12	Towel forceps, 3" (Backhaus)
	TONGUE DEPRESSORS
2	Tongue depressors (Bosworth)
	CATHETERS
1	Whistle-tip red rubber catheter 14 Fr., Sim's tip
1	Whistle-tip red rubber catheter 16 Fr., Sim's tip
1	Anesthesia tracheostomy set, Size No with outer tube, and L-shaped cann with length of plastic tubing (Schwel

BONE SET NO. 1

Quantity	Description
3	Bone curettes (Brun) one each, Sizes 4 and 6
1	Wooden mallet
2	Osteotomes (Stille) one each, Size 8 a Size 12
1	Periosteal elevator (Lane) narrow 6½"
2	Rongeurs (Luer) straight, 7"

BONE SET NO. 2

Quantity	Description
3	Bone curettes (Brun) one each, Sizes 4 and 6
1	Rib cutter (Bethune)
1	Bone-cutting forceps (Liston) 8"
1	Bone drill (Hudson)
1	Bone-holding forceps, 13" (Lane)
2	Osteotomes (Stille) one each, Size 8 and Size 12
2	Periosteal elevators (Lane) narrow 6½"
3	Rongeurs (Luer) straight 7"
1 (pair)	Saw handles (Gigli)
2	Saws, 20" (Gigli)
1	Bone saw (Stryker)
1	Wooden mallet

BONE SET NO. 3

Quantity	Description
1	Bard-Parker handle, #3
1	Bard-Parker handle #4
2	Bard Parker blades, Size 10
2	Bard Parker blades, Size 20
6	Tenacula forceps (Allis)
1	Straight dissecting scissors
1	Curved dissecting scissors
1	Suture scissors

Quantity	Description
2	Tissue forceps
2	Rake retractors (Volkman)
3	Needle holders
1	Rib cutter (Bethune)
1	Rib raspatory and elevator (Doyen)
1	Raspatory (Mathieu)
60	*Mosquito clamps* (Halstead)
50	Clamps, straight 6" (Kelly)
2	Small loop retractors (Greene)
2	Osteotomes (Stille) one each Size 8 and Size 12
1	Wooden mallet
1	Bone saw (Stryker)

DENTAL SET

ELEVATORS

Quantity	Description
1	Left (Seldin)
1	Right (Seldin)

TOOTH-EXTRACTING FORCEPS

Quantity	Description
1	Lower molar (Horn Beak)
1	Universal lower
1	Lower anterior (Ash)
1	Universal upper

TRACHEOSTOMY SET No 1

FORCEPS

Quantity	Description
2	Tissue forceps (many teeth) 6"
4	Towel forceps (Backhaus)
2	Sponge-holding forceps

HEMOSTATIC FORCEPS

Quantity	Description
12	Mosquito forceps (Halstead) straight

HOOKS

Quantity	Description
3	Tracheostomy hooks, 1 prong

NEEDLE HOLDERS

Quantity	Description
3	Needle holders, 6"

RETRACTORS

Quantity	Description
2	Small loop *retractors (Greene)*
2	Small retractors (Langenbeck)
2	Retractors, blunt 2 prong (Volkman)

SCALPELS

Quantity	Description
2	Bard Parker handles, #3
2	Bard-Parker blades, Size 10
2	Bard Parker blades, Size 11

SCISSORS

Quantity	Description
1	Dissecting scissors, straight, 5½" (Mayo)
1	Dissecting scissors, curved, 5½" (Mayo)
1	Suture scissors, straight 5½" sharp-blunt

SUCTION TUBES

Quantity	Description
2	Suction tubes (Yankauer)
2	Head and neck suction tubes, straight 8"
1	Whistle-tip red rubber catheter 14 Fr with Sim s tip
1	Whistle-tip red rubber catheter 16 Fr., with Sim s tip

SYRINGES

Quantity	Description
1	2 cc. syringe with 20 gauge x 1½" needle for 10% cocaine
1	10 cc. syringe with 25 gauge x ¾" needle

TRACHEOSTOMY TUBES AND TAPES

Quantity	Description
1	Tracheostomy tape
1	Tracheostomy tube introducer
1	Tracheostomy tube #6 regular
1	Tracheostomy tube #6, short
1	Tracheostomy tube special inner cannula, with extension, #6 (Martin)

TRACHEOSTOMY SET No. 2

(When performed as a part of a more extensive procedure, the following are added to Basic Sets No 1 and No 2.)

Quantity	Description
3	Tracheostomy hooks, 1 prong
1	2 cc. syringe with 20 gauge x 1½" needle for 10% cocaine
1	Tracheostomy tape
1	Tracheostomy tube introducer
1	Tracheostomy tube #6 regular with extension (Martin)
1	*Tracheostomy* tube #6 short, with extension (Martin)

I Lip and Skin of Face

1 *Cheiloplasty (Estlander or Bernard)*
Basic Set No 1 plus
5 cc. syringe and needle

2. *Simple or V-excision of Lower Lip*
Basic Set No 1 plus
5 cc. syringe and needle

3 *Subtotal Excision of Mucosa of Lower Lip (Stripping)*
Basic Set No. 1 plus
5 cc. syringe and needle

4 *Rhinoplasty for Cancer of Skin of Nose*
Basic Set No 1

5 *Excision of Skin Cancer of Face Scalp and Ear*
Basic Set No 1 plus
Dermatome
Rongeur (Luer)

6. *Formation or Migration of Tubed Pedicle Graft*
Basic Set No 1 plus
5 cc. syringe and needle

II Cheek (Buccal Mucosa)

7 *Excision of Tumor of Mucosa of Cheek with Closure*
Basic Set No 1 plus
Dermatome
Cheek retractor
2 tongue depressors
2 mouth gags

8 *Excision of Tumor of Mucosa of Cheek through a Weber Fergusson Incision*
Basic Set No 2 plus
1 lip and cheek retractor

9 *Excision of Tumor of Mucosa of Cheek Combined with Neck Dissection*
Basic Set No. 2
Bone Set No 1
Tracheostomy Set No. 2
Dental Set

III Mandible Gum Alveolar Process

10 *Marginal Resection of Mandible*
Basic Set No. 2
Bone Set No 2
Tracheostomy Set No 2
Dental Set

11 *Partial Resection of Mandible*
Basic Set No 2
Bone Set No 2
Tracheostomy Set No 2
Dental Set

12. *Segmental Resection of Mandible with Bone Graft (Ilium)*
Basic Set No 2
Bone Set No 2
Tracheostomy Set No. 2
Dental Set, plus
4 scalpel blades
6 forceps (Allis)
2 nerve-dissecting hooks (Martin)
1 straight dissecting scissors
1 curved dissecting scissors
1 suture scissors
2 tissue forceps
1 rake retractor (Volkman)
3 needle holders
2 lip and cheek retractors

13 *Segmental Resection of Mandible with Bone Graft (Rib)*
Basic Set No 2
Bone Set No 2
Tracheostomy Set No. 2
Dental Set, plus
4 scalpel blades
6 forceps (Allis)
2 nerve-dissecting hooks (Martin)
1 straight dissecting scissors
1 curved dissecting scissors
1 suture scissors
2 tissue forceps
2 rake retractors, 6-prong (Volkman)
3 needle holders
1 Bethune (extra)
2 cheek retractors
Rib raspatory and elevator (Doyen)
Raspatory (Mathieu)

14 *Local Excision of Gum and Lower Alveolar Process*
Basic Set No 1
Bone Set No. 1 plus
2 tongue depressors
1 lip and cheek retractor
2 mouth gags

IV Pterygomaxillary Space

15 *Excision of Tumor of Pterygomaxillary Space*
Basic Set No. 2
Tracheostomy Set No. 2
Dental Set, plus
Parotid spoon retractors (Martin) set of 4 (for use as curettes)

V Tongue and Floor of Mouth

16 *Local Excision of Lesions of the Tongue*
Basic Set No 1 plus
1 tongue depressor
3 lip and cheek retractors

17 *Partial Glossectomy*
Basic Set No 2
Tracheostomy Set No. 2, plus
2 cheek retractors

18. *Subtotal Glossectomy Combined with Neck Dissection*
    - Basic Set No. 2
    - Bone Set No 2
    - Tracheostomy Set No 1
    - Tracheostomy Set No 2, plus
        - 2 cheek retractors
19. *Local Excision of Tumor of Floor of Mouth*
    - Basic Set No 1 plus
        - 2 lip and cheek retractors

VI ANTRUM, NASAL CAVITY NASOPHARYNX, MAXILLA AND PALATE

20. *Rhinotomy*
    - Basic Set No. 2
    - Bone Set No 2
    - Dental Set, plus
        - Paranasal sinus operating forceps (Martin)
        - Parotid spoon retractors (Martin) set of 3 (for use as curettes)
        - 2 cheek retractors
21. *Local Excision of Upper Gum and Alveolar Process*
    - Basic Set No 1
    - Bone Set No 1 plus
        - Paranasal sinus operating forceps (Martin)
        - 2 lip and cheek retractors
        - 2 mouth gags
        - 2 metal tongue depressors
22. *Antrostomy through Alveolar Process*
    - Basic Set No 1
    - Bone Set No 2, plus
        - 2 mouth gags
        - 2 metal tongue depressors
        - Paranasal sinus operating forceps (Martin)
        - 3 lip and cheek retractors
        - Parotid spoon retractors (Martin) set of 3 (for use as curettes)
        - Operating room headlight (Welch-Allyn)
23. *Partial Resection of Maxilla*
    - Basic Set No 2
    - Bone Set No 2, plus
        - Paranasal sinus operating forceps (Martin)
        - Dermatome
        - Parotid spoon retractors (Martin) set of 3 (for use as curettes)
        - 2 cheek retractors
        - Operating room headlight (Welch-Allyn)
24. *Radical Resection of Maxilla with Exenteration of Orbit*
    - Basic Set No. 2
    - Bone Set No 2
    - Dental Set, plus
        - Paranasal sinus operating forceps (Martin)
        - Dermatome
        - Parotid spoon retractors (Martin) set of 3 (for use as curettes)
25. *Excision of Tumor of Soft Palate*
    - Basic Set No. 1 plus
        - 2 mouth gags
        - 2 tongue depressors (Bosworth)
        - 2 cheek retractors
        - Paranasal sinus operating forceps (Martin)
        - Operating room headlight (Welch Allyn)
26. *Excision of Tumor of Hard Palate*
    - Basic Set No. 2
    - Bone Set No 1 plus
        - Paranasal sinus operating forceps (Martin)
        - Parotid spoon retractors (Martin) set of 3 (for use as curettes)
        - 2 cheek retractors
        - Operating room headlight (Welch-Allyn)
27. *Snare Removal of Nasopharyngeal Tumor*
    - Basic Set No 1 plus
        - #16 French catheter
        - 2 ft. of steel wire
        - Paranasal sinus operation forceps (Martin)
        - Tongue depressor (Bosworth)
        - Specially-selected snare instrument
        - Wire cutter
        - Suction apparatus
        - Previously-prepared nasopharyngeal tampon
        - Operating room headlight (Welch-Allyn)

VII PAROTID AND SUBMAXILLARY SALIVARY GLAND

28. *Subtotal Parotidectomy*
    - Basic Set No 2, plus
        - Parotid spoon retractors (Martin) set of 3
        - 2 nerve dissectors (Martin)
29. *Total Parotidectomy*
    - Basic Set No 2, plus
        - Parotid spoon retractors (Martin) set of 3
        - 2 nerve dis

30 *Total Parotidectomy Combined with Neck Dissection*
Basic Set No 2, plus
Parotid spoon retractors (Martin) set of 3
2 nerve dissectors (Martin)

31 *Excision of Submaxillary Salivary Gland*
Basic Set No 2

VIII PHARYNGOTOMY

32. *Anterior Pharyngotomy*
Basic Set No. 2

33 *Lateral Pharyngotomy*
Basic Set No. 2

IX MISCELLANEOUS

34 *Ligation of External Carotid Artery*
Basic Set No 1

35 *Fusion of Eyelid*
Basic Set No. 1 plus
Rubber tubing (No 12 French catheter)

36. *Approach to Mediastinum by Splitting or Resection of Sternum*
Basic Set No 2
Bone Set No 2
Tracheostomy Set No 2, plus
Rib retractor (Finochietto)
Sternum knife (Lebsche)

37 *Thyroglossal Duct Cyst or Branchogenic Cyst*
Basic Set No 2, plus
1 bone forceps (Liston) 8"
2 tracheostomy hooks, 1 prong

38 *Branchogenic Fistula*
Basic Set No 2, plus
Tuberculin syringe
2 blunt needles
1 probe (Theobald)
Methylene blue
Fine braided wire

39 *Ligation of Parotid Ducts*
Basic Set No. 1 plus
Fine braided wire

X NECK DISSECTION

40 *Radical Neck Dissection*
Basic Set No 2

41 *Radical Neck Dissection Combined with Excision of Primary Lesion of the Mouth (Commando)*
Basic Set No 2
Bone Set No 2
Tracheostomy Set No 2
Dental Set, plus
2 cheek retractors

42. *Neck Dissection and Excision of Primary Lesion with Marginal Resection of the Mandible*
Basic Set No 2
Bone Set No 2
Tracheostomy Set No 2
Dental Set plus
2 cheek retractors

43 *Neck Dissection Combined with Axillary Dissection*
Basic Set No. 2
Bone Set No. 1

XI THYROID

44 *Thyroidectomy*
Basic Set No 2
Tracheostomy Set No 2, plus
4 goiter tenacula (Lahey)

45 *Hemithyroidectomy Combined with Neck Dissection*
Basic Set No 2
Tracheostomy Set No 2, plus
2 goiter tenacula (Lahey)
1 tracheostomy tube with #6 extension

XII LARYNX

46. *Partial Laryngectomy*
Basic Set No 2, plus
2 self-retaining rake retractors (Lorie mastoid retractors)
Gauze larynx tampon with silk suture attached (used with 10% cocaine)
Thrombin solution and Gelfoam
2 single tracheal hooks
3 double tracheal hooks
1 narrow osteotome
1 bone saw (Stryker)
2 bone cutters (Liston)
1 ball-tip scissors (Martin)
1 angle scissors (Dean tonsil scissors)
1 heavy curved scissors (Mayo)
#6 and #8 tracheostomy anesthesia tubes with right-angle attachment and attached balloon cuff (Schweizer)

47 *Total Laryngectomy or Pharyngolaryngectomy Combined with Neck Dissection*
Basic Set No 2, plus
2 self retaining rake retractors (Lorie mastoid retractors)
Plastic tubing for anesthesia connection
2 cc. syringe and needles

1 heavy curved scissors (Mayo)
2 single tracheal hooks
3 double tracheal hooks
2 bone cutters (Liston)
Intratracheal tube with inflatable cuff (Martin)
#10 and #12 laryngectomy tubes, with extension inner cannulae
Punch (large) for marking skin (Martin)
4 goitre tenaculum forceps (Lahey)
Laryngectomy anesthesia tubes, 3 sizes (Martin Flynn)

In case of skin graft for pharyngeal defect add.
Latex stent (Negus)
Dermatome

APPENDIX B

RESIDENT'S OPERATIVE REPORT

The number of separate surgical procedures in the head and neck is greater and more varied than in most other parts of the body In addition there are many complementary procedures, such as tracheostomy and ligation of major vessels In order that accurate analysis and statistical reporting of procedures may be made, a detailed record is kept by the Head and Neck Service at Memorial Hospital It is a rigid rule that the resident must dictate his operative report for the hospital chart on the day the operation is performed At the same time he fills out a special Resident s Operative Report using a numbered list of operations and special features as illustrated below This routine makes possible the use of I B.M cards for analysis Numbers are assigned to operations for this specific purpose alone they bear no relation to the code numbers given in the American Medical Association s Standard Nomenclature of Operations

MEMORIAL HOSPITAL

RESIDENT'S OPERATIVE REPORT—HEAD & NECK SERVICE

Key Punch Field

1-6 ________ DATE OF OPERATION

________ PATIENT'S NAME

7-12 ________ CASE NUMBER

13 PATIENT'S STATUS (Circle One)

1. Private or Semi Private
2. Memorial Ward
3. Ewing Ward
4. Pediatrics
5. O P D

H & N TUMOR DIAGNOSES

14-17 ______ Code ______

18-21 ______ Code ______

22-25 ______ Code ______

OTHER SERVICE TUMOR DIAGNOSES

26-29 ______ Code ______

______

30-32 ______ OPERATING SURGEON ______

33-35 ______ FIRST ASSISTANT ______

36-38 ______ RESPONSIBLE ATTENDING SURGEON

______

39 (Circle One)

1. Scrubbed Up
2. Present in O.R.
3. Not Present in O.R.

PRIMARY OPERATION

(See Reverse—Give Full Particulars, Include Primary Site)

40-42 ______ Code ______

43-45 ______ Code ______

46-48 ______ Code ______

49-51 ______ Code ______

______

______

______

COMPLEMENTARY OPERATIVE PROCEDURES

(See Reverse—Give Full Particulars)

52-54 ______ Code ______

55-57 ______ Code ______

58-60 ______ Code ______

______

______

SPECIAL OPERATIVE FEATURES

(See Opposite)

61-62 ______ Code ______

63-64 ______ Code ______

65-66 ______ Code ______

67-68 ______ Code ______

______

SPECIAL OPERATIVE FEATURES

EXCISION, SECTION OR LIGATION OF ANY FOLLOWING STRUCTURES

1. Ligation of Common Carotid Artery
2. Ligation of Internal Carotid Artery
3. Ligation of External Carotid Artery
4. Resection of Common or Internal Carotid Artery and Anastomosis
5. Ligation of Subclavian Artery
6. Ligation of Subclavian Vein
7. Section or Excision of 2nd Internal Jugular Vein
8. Section of Main Trunk of 7th Cranial Nerve
9. Section of One of Main Divisions (only) of 7th C
10. Section of Ramus Mandibularis of 7th Nerve
11. Section or Excision of 10th Cranial Nerve
12. Section or Excision of Recurrent Laryngeal Nerve
13. Section or Excision of Superior Laryngeal Nerve
14. Section or Excision of 12th Cranial Nerve
15. Ligation of Main Trunk of Thoracic Duct
16. C

UNUSUAL FEATURES

20. Death in Operating Room or Recovery Room
21. Cardiac Arrest
22. Pneumothorax discovered in Operating Room or Room
23. Disease Left Behind
24. Gold Seed Insertion (Specify—size, number, and
25. Elective Pharyngostome
26. Primary Pharyngeal Closure (with separate
27. Pharyngeal Stent with Skin graft
28. Mandible Replacement (Bone, wire, mesh, etc.)
29. Resection of bone of skull with skin graft over dura or
30. Spinal Fluid leakage during operation
31.

000 LOCAL EXCISION NOT OTHERWISE CLASSIFIED

- 010 SKIN OF HEAD AND NECK (Specify Site)
- 020 CERVICAL NODE (Specify Site)
- 030 SOFT PART TUMOR (Specify)
- 040 BONES (H & N Primary)
  - 041 Mandible (Specify Extent of Resection i.e. Total, Partial)
  - 042 Other Bones (Specify)
- 050 CYST OR FISTULA
  - 051 Sebaceous Cyst
  - 052 Branchial Cyst or Fistula
  - 053 Thyroglossal Duct Cyst or Fistula
  - 054 Other Cyst or Fistula
- 060 INCISION AND DRAINAGE (Specify Site)

100 RESECTION OF ORGAN (OR PART) OF UPPER RESPIRATORY AND/OR ALIMENTARY TRACT

- 110 LIPS
  - 111 Local or V Excision (Specify Upper or Lower)
  - 112 Lip Stripping
  - 113 Estlander or Bernard or Other Cheiloplasty (Specify)
  - 114 Any of Above Combined with Neck Dissection (Specify)
  - 115 Any of Above Combined with Bone Resection (Specify)
  - 116 Other (Specify)
- 120 TONGUE
  - 121 Local Excision
  - 122 Partial Glossectomy
  - 123 Subtotal Glossectomy
  - 124 Glossectomy plus Separate Neck Dissection
  - 125 Glossectomy with Laryngectomy and Neck Dissection
  - 126 Tongue "Commando"
  - 127 Other (Specify)
- 130 BUCCAL MUCOSA
  - 131 Local Excision and Suture
  - 132 Local Excision and Skin Graft
  - 133 Cheek Resection with Through & Through Defect
  - 134 Cheek Resection with Plastic Closure
  - 135 Excision with *Maxillary Resection*
  - 136 Cheek "Commando"
  - 137 Other (Specify)
- 140 GUM OR GINGIVA
  - 141 Local Excision (Specify Upper or Lower)
  - 142 Local Excision with Marginal Resection
  - 143 Local Excision with Maxillary Resection
  - 144 Gum "Commando"
  - 145 Gum Resection with separate Neck Dissection
  - 146 Other (Specify)
- 150 FLOOR OF MOUTH
  - 151 Local Excision
  - 152 Local Excision with Marginal Resection
  - 153 Floor of Mouth "Commando"
  - 154 Other (Specify)
- 160 PALATE (Specify Hard or Soft)
  - 161 Local Excision
  - 162 Local Excision with Partial Maxillectomy
  - 163 Excision plus separate Neck Dissection
  - 164 Other (Specify)
- 170 TONSIL
  - 171 Tonsillectomy
  - 172 Tonsillectomy plus separate Neck Dissection
  - 173 Tonsil "Commando"
  - 174 Other (Specify)
- 180 NASAL CAVITY AND NASOPHARYNX
  - 181 Local Excision (Specify Site)
  - 182 Radical Excision of Nasal Contents, Sinuses, Septum, Overlying Skin, Soft Parts and Skin Graft (Specify)
  - 183 Other (Specify)
- 190 PARANASAL SINUSES
  - 191 Antrotomy and Curettage
  - 192 Antrotomy (Caldwell Luc)
  - 193 Partial Maxillectomy
  - 194 Subtotal Maxillectomy
  - 195 Maxillectomy with Orbital Exenteration
  - 196 Any of Above with separate Neck Dissection
  - 197 Maxillectomy "Commando"
  - 198 Other (Specify)

200 OPERATIONS ON LARYNX AND/OR PHARYNX

- 210 PARTIAL LARYNGECTOMY AND/OR PHARYNGECTOMY
  - 211 Partial Laryngectomy Through Laryngofissure
  - 212 Partial Laryngectomy Through Ant. Pharyngotomy
  - 213 Partial Laryngectomy Through Lat. Pharyngotomy
  - 214 Partial Pharyngectomy Thru Ant. or Lat. Pharyngotomy
- 220 TOTAL LARYNGECTOMY AND/OR PHARYNGECTOMY
  - 221 Total Laryngectomy Alone
  - 222 Total Laryngectomy after Exploratory Laryngo-Fissure
  - 223 Total Laryngectomy plus Neck Dissection
  - 224 Laryngo-Pharyngectomy with Neck Dissection
- 230 SUBTOTAL LARYNGECTOMY with NECK DISSECTION
- 240 TRACHEOSTOMY ALONE
- 250 DIRECT LARYNGOSCOPY
- 260 DIRECT LARYNGOSCOPY PLUS CORD STRIPPING
- 270 ARYTENOIDECTOMY
- 280 OTHER (Specify)

300 OPERATIONS ON THYROID AND/OR PARATHYROID

- 310 PARTIAL THYROIDECTOMY
  - 311 Hemi-thyroidectomy Alone
  - 312 Hemi-thyroidectomy plus Neck Dissection
  - 313 Subtotal Thyroidectomy Alone
  - 314 Subtotal Thyroidectomy plus Neck Dissection
  - 315 Lingual Thyroidectomy
- 320 TOTAL THYROIDECTOMY
  - 321 Total Thyroidectomy Alone
  - 322 Total Thyroidectomy with Neck Dissection (Unilateral or Bilateral — Specify)
- 330 THYROIDECTOMY (Specify Extent) PLUS LARYNGECTOMY FOR THYROID CANCER
- 340 EXCISION OF PARATHYROID TUMOR (Specify Site — Neck or Mediastinum)
  - 341 Excision of Parathyroid Tumor plus Neck Dissection
- 350 OTHER (Specify)

400 OPERATIONS ON MAJOR SALIVARY GLANDS

- 410 PARTIAL OR SUBTOTAL PAROTIDECTOMY
  - 411 Parotidectomy with or without 7th Nerve Res. (Specify)
  - 412 Parotidectomy plus Ramus Resection
  - 413 Parotidectomy (Combined Approach)
- 420 EXCISION OF SUBMAXILLARY GLAND
  - 421 Excision of Submaxillary Gland plus Marginal Resection
- 430 ANY OF ABOVE PLUS NECK DISSECTION (Specify)
- 440 REMOVAL OF CALCULUS FROM DUCT OR GLAND (Specify)
- 450 PAROTID DUCT LIGATION
- 460 OTHER (Specify)

500 OPERATIONS ON ORGANS OF SPECIAL SENSES

- 510 OPERATIONS ON EYE OR ORBIT
  - 511 Enucleation of Eye
  - 512 Exenteration of Orbit
  - 513 Local Excision of Tumor of Orbit
  - 514 Local Excision of Lid (Specify)
  - 515 Local Excision of Lid (Plastic Repair — Specify)
- 520 OPERATIONS ON MIDDLE AND INNER EAR
  - 521 Mastoidectomy
  - 522 Radical Resection of Temporal Bone
  - 523 Other (Specify)

600 NECK DISSECTION — ALONE

- 610 UNILATERAL NECK DISSECTION
- 620 UNILATERAL — SECOND NECK DISSECTION
- 630 BILATERAL NECK DISSECTION (SIMULTANEOUS)

700 MISCELLANEOUS H & N PLASTIC OPERATIONS

- 710 FORMATION OF PEDICLE TUBE
  - 711 Migration of Pedicle Tube
- 720 SKIN GRAFT ALONE (Pinch, Split Thickness, Full Thickness, etc. (Specify))
- 730 EYELID FUSION
- 740 OTHER (Specify)

800 OTHER UNCLASSIFIED H & N OPERATIONS — (Specify)

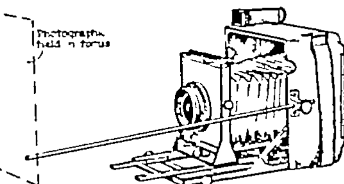
APPENDIX C

PHOTOGRAPHIC CONTROL OF SURGICAL DRAWINGS

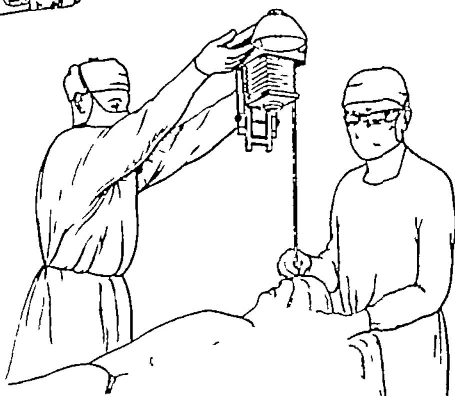
The surgical artist and his equipment are necessarily unsterile therefore he often cannot approach near enough to the operative field to obtain a direct 90 angle view—the surgeon s view Standing at a distance of 3 feet or more, his view of the operative area and his drawing must be oblique, a serious defect in many surgical drawings If in addition to the surgical artist present and sketching there is a photographer with special equipment the surgeon can call for photographs of successive stages of an operation when he has the tissues posed exactly as he desires If the camera has an attachment of a sterilized metal rod the surgeon grasps the metal rod and so controls the area to be photographed, while the photographer standing well outside the operative field can simply press the shutter and flash From a set of 10 to 30 photographs taken in this manner the artist and the surgeon together can plan a composite set of 5 to 10 drawings with the assurance that the delineation is accurate All the complicated drawings in this book were made with this photographic control usually with the artist also present in the operating room

C1 A special lug can be constructed by any competent mechanic and fastened to the side of a box camera This lug will hold firmly a sterilized rod which has been accurately marked so as to measure a fixed focus on the photographic field

C2 The photographer wearing a gown and mask holds the camera The surgeon grasps the metal rod and directs it to the photographic field at the angle from which the photograph is to be taken He then tells the photographer when the camera is in position and the picture is snapped by the light of a flash



C1 Camera with rod.



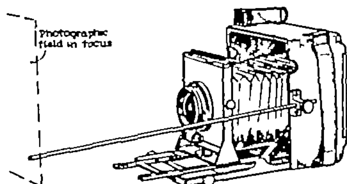
C2 Camera in ı

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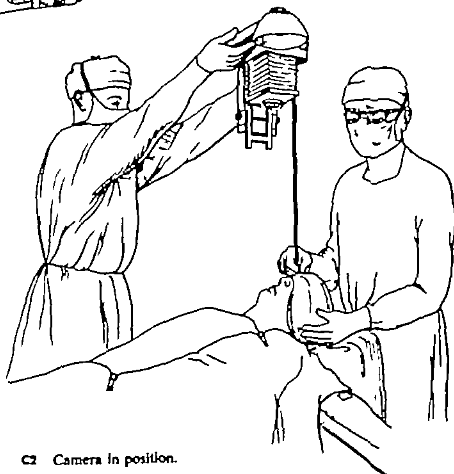
Illustrations, as well as text, will be found on pages indicated by *italic* type.

C1 A special lug can be constructed by any competent mechanic and fastened to the side of a box camera This lug will hold firmly a sterilized rod which has been accurately marked so as to measure a fixed focus on the photographic field.

C2 *The photographer wearing a gown and mask* holds the camera. The surgeon grasps the metal rod and directs it to the photographic field at the angle *from which the photograph is to be taken. He then* tells the photographer when the camera is in position and the picture is snapped by the light of a flash



C1 Camera with rod



C2 Camera in position.

INDEX

Illustrations, as well as text, will be found on pages indicated by *italic* type